# SOUTHERN POWER AND INDUSTRY

Ad Index, pege 114

JULY, 1951

South Carolina—Air Conditioning ...

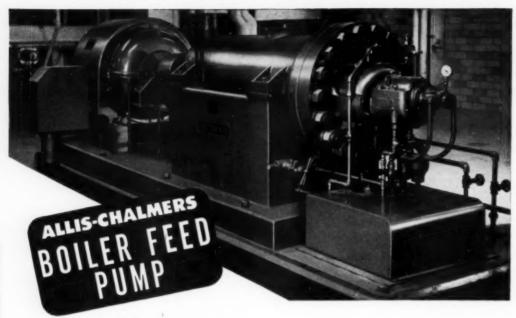
#### In This Issue

#### REPORTS FROM SOUTHERN PLANTS

Celanese Corporation engineer reports on three new methods for cooling conditioned air	
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New Methods Cooling With Steam See Page 42



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- Single stage, back-to-back impellers balance axial forces without use of balancing drum. Two impellers in first stage give advantages of double suction at this point.
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Volume 69

Number 7



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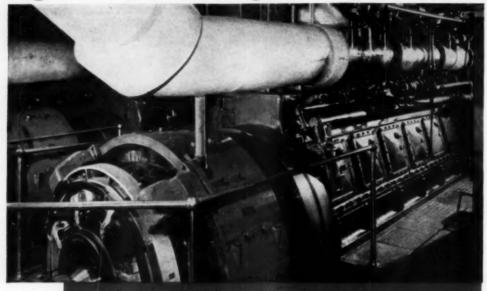
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#### Business Representatives

- E. L. Rogers, 299 Madison Ave., New York 17, N. Y.—Phone Murray Hill 2-4959.
- George Isherwood, 413 Alexander Ave., Drexel Hill, Pa.— Phone, Clearbrook 94536.
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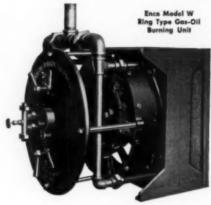
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### Facts and Trends

#### FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

July, 1951

SOUTHWESTERN PUBLIC SERVICE COMPANY of Amarillo, Texas is now constructing a new generating station near Amherst, Texas with a present scheduled generating capacity of 150,000 kw. Total boiler capacity will be 1,500,000 lb/hr. Initial 50,000 kw unit is scheduled for operation by May, 1952 and the second unit, of 115,000 kw capability, for operation by June, 1953. Turbine-generators are General Electric.

Combustion Engineering-Superheater, Inc., 500,000 and 1,000,000 lb/hr boilers will be used. Both will be installed for outdoor operation. Turbine, heaters, and pumps will be housed in an insulated steel panel building, pressurized to limit dust nuisance, and all controls for the turbines, boilers, and electrical equipment will be centralized on one control room.

Mr. H. O. Hodson, Vice-President and Operating Manager of the Southwestern Public Service Company advises that the 1,000,000 lb/hr boiler is tangentially fired with four vertically adjustable gas burners, one group of burners in each of the four corners of the furnace. Superheat control will be accomplished by tilting these burners.

REYNOLDS METALS COMPANY'S CORPUS CHRISTI, TEXAS aluminum reduction plant will have 78 internal combustion engines totalling 256,300 hp and driving d-c generators with a total rated output of 176,000 kw. Using natural gas for fuel, it will be the largest gas-burning engine plant so far built.

One Section will contain 40 Cooper-Bessemer Type LSV, 16 cylinder, 3700 hp, 4 cycle engines, each driving a 2500 kw d-c generator. Total output of this group is 100,000 kw. Second group includes 38 General Motors Model 16-358X, 2850 hp, 2 cycle engines, each driving a 2000 kw d-c generator for a total output of 76,000 kw.

SEVERAL GULF COAST AND SOUTH ATLANTIC TANKERS are mineral wool insulated to keep stock warm in transit and to avoid reheating for unloading at destination. Tanks on the barges are covered with  $1\frac{1}{2}$ —in. thick mineral wool board insulation to insure no more than 20 F temperature drop for a six-day trip at 32 F outside temperature.

Temperature drop from loading point to destination is negligible. For example, on a trip from Houston to New Orleans — 4 days at approximately 75 F outdoors — Bright Stock was loaded at 95 F and lost one degree in transit. Neutral Stock on the same trip was discharged at 86 F — a three degree drop from the loading temperature.

THE CELANESE CORPORATION AIR CONDITIONING ENGINEER AT ROCK HILL, S. C. reports in this issue on how steam can be used as a medium for cooling conditioned air. The systems noted are new and progress is being made every year — steam jets, turbine driven centrifugal compressors, and lithium salt absorption systems. Assuming that the system needed is large enough, the determining factor is the cost of steam and water.

In most instances, plant boilers are large enough to provide all of the steam needs for cooling in summer if they are large enough to provide heating in winter. Cost of steam should be figured on a basis of cost per pound for the additional load required for air conditioning — a figure which is very much lower than the average cost when the boiler is operated at part load for process steam alone.

BENTWOOD PRODUCTS CO. OF LOUISVILLE, KY. constantly maintains the questioning attitude "How can we eliminate; how can we improve?" Embry C. Rucker, factory manager of the company, emphasized at the Fourth National Materials Handling Exposition that the BEST MATERIALS HANDLING is the ABSENCE OF MATERIALS HANDLING.

It is so easy when one has the problem of transporting material from one place to another to jump immediately into determining the type of equipment required. In nearly every case there is an excellent materials handling equipment device that will do the job well. First find out if there is any possible way to eliminate the handling.

It's foolish to believe that they could all be solved that easily. However, start with these questions: Can I eliminate it? Can I minimize it? If I can minimize it, what is the most economical and best equipment available?

UNION BAG'S SAVANNAH, GEORGIA plant is recognized as the world's largest integrated kraft container plant, employing over 5,000 whose annual wages this year will exceed \$15 million. It is a mass production kraft operation, manufacturing through the sulphate process, kraft paper, kraft paperboard, bags, and corrugated shipping containers.

Maintenance is big business at Union Bag. Last year their repair maintenance bill was \$1,768,000 and material used in capital additions was \$2,635,000. Over 400 are employed in the maintenance crews and stores serving this division. The company has 46 mechanical engineers, 23 civil, 9 electrical, 25 chemical and 20 industrial engineers.

Union Bag is now increasing daily production capacity by approximately 400 tons. This includes a new paper machine and equipment for the manufacture of semi-chemical pulp. Completion is scheduled for late '52 or early '53.

- COLLAPSIBLE, RETURNABLE AND REUSABLE METAL DRUMS are on the market suitable for the shipment of oils, greases, fats, acids, paints, etc. The new 55-gallon synthetic rubber-fabric drum of U. S. Rubber Company should effect sizable savings in return shipping costs, since more than 2500 collapsed drums can be shipped in a standard railroad box car that would hold only 300 rigid drums. An empty 55 gallon synthetic rubber-fabric drum weighs less than 30 lb. No venting is required while being filled or emptied, eliminating hazards in handling certain acids and liquid combustibles.
- PLANT ENGINEERING AIDS IN BRIEF Check the New Equipment section of this issue for applicational data on the new Hy-Vo (high velocity) CHAIN DRIVE of Morse Chain Company. Unit is designed for speed applications higher than conventional chain drives and to replace belt drives now required for high-speed transmission. Manufacturer claims that a 6-in. Hy-Vo Drive will do the work of a 24-in. belt.

Check the new POWER FACTOR VISUALIZER of Westinghouse that simply explains the use of capacitors in solving low power factor problems. The slide-rule-type chart explains just what low power factor is, what it means to both power user and power supplier, and what benefits can be obtained by improving the power factor in the industrial distribution system through installation of capacitors.

Check Otis Elevator on proper ELEVATOR DESIGN for industrial truck loading. Use of industrial trucks with an elevator not designed for such use might be dangerous and cause rapid deterioration. Otis bulletin 8-2033 covers installation factors in an old building and designs for new industrial factories.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY 806 Peachtree St., N.E. Atlanta 5, Ga.

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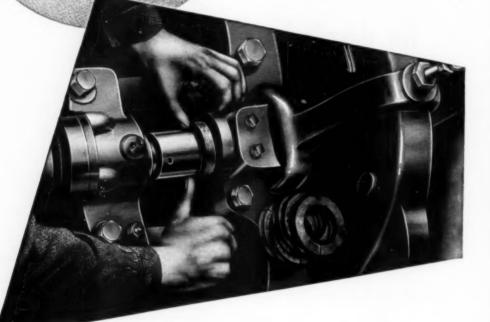
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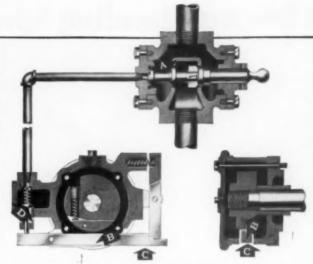
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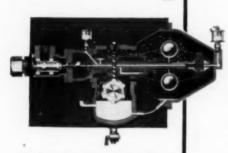
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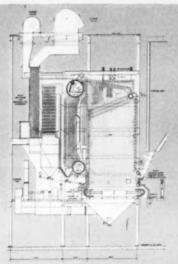
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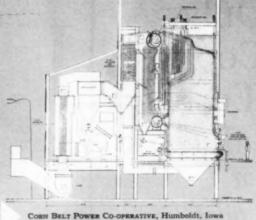
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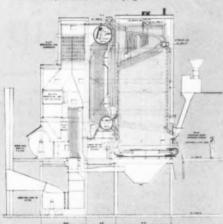
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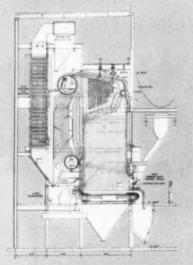
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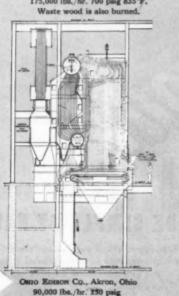
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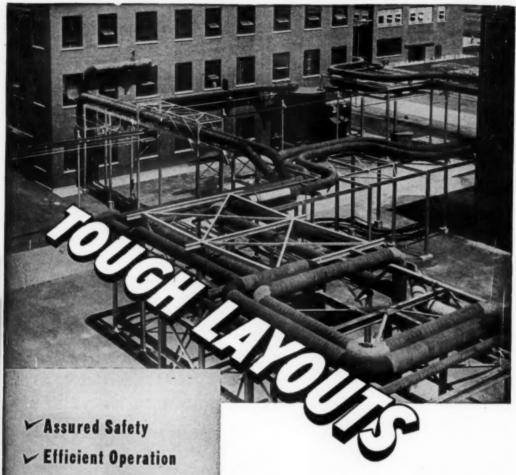
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- 7 WATER TUBE BOILERS—Bulletin, 12 pages—Illustrates and describes special and standard power plant boilers and packaged steam generators. Complete engineering data, dimensions, illustrations, etc. —SPRINGFIELD BOILER CO.
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- 40 OIL AND GAS BURNERS, STOK-Gescriptions, flustrations, engineering data and Selector Guide—Capacity Tables covering all fuel burning equipment.—IRON FIREMAN MFG. CO.
- 54 STEEL BOILERS—Catalog 92—Describes Kewanee steel boilers in
  square jacket, round jacket and various
  types and sizes, suitable for small and modcrate operations—with charts giving ratings,
  specifications, measurements and application.
  —KEWANEE BOILER CORP.
- 56 SOLID ROTOR BACK PRESSURE TURBINE Bulletin S-116 Describes the Terry solid wheel rotor turbine and its various applications, particularly those of back-pressure. THE TERRY STEAM TURBINE CO.
- 58 OH. BURNERS—Bulletin 24—Describes the SAL steam atomizing oil burner, a large capacity unit with great flexibility of performance. Fewer burners with higher performance.—NATIONAL AIROUL MFG. CO., INC.
- 69 UNDERFEED STOKERS Bulletin SR-27—Describes the design and application of the Eric City underfeed type stoker—with suggestions as to the solution of your particular problem.—ERIE CITY IRON WORKS.

91 ELECTRICAL PRECIPITATORS
LIQUID MATTER—BOOKET—Describes the
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#### FANS—PUMPS—COMPRESSORS HEATERS—HEAT EXCHANGERS

- 121 HIGH SPEED CENTRIFUGAL
  SUCTION-Bulletin 236-Gives specifications,
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  DBH high speed, single stage, double suction pumps, capacity 100 to 1,000 G.P.M.,
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- 138 CENTRIFUGAL PUMPS Bulletin w.305-Bil, 12 pages—Describes various types of centrifugal pumps for belt, multi-V belt and other motor drives, with closed impellers—single stage units, for pumping hot or cold water, brine, process liquors, light oils and similar liquids. Specifications, ratings, installations, and dimensions.—WORTHINGTON PUMP & MACHINERY CORP.
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- 170 PUMPS IN GENERAL—All types of well turbines—boosters, process pumps—deepwell turbines—boosters, process pumps, nonclog, approved type fire pumps, axial-dow, boiler feed domestic water and specialty pumps.—PACIFIC PUMPS, INC.
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- 264 LEVEL CONTROLLER Rulletin F-2 describes the "Level-Trol," a level controller which is readily exchanged, replaced or repaired and which features one control for proportional band and specific gravity adjustments, using pneumatic pilot without intervening links or mechanical joints.—FISHER GOVERNOR CO.
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#### PLANT EQUIPMENT—WELDING TOOLS—PROCESS SPECIALTIES

- 303 STEEL STORAGE TANKS—Bulletin
  A pages—"Welded Steel Tanks for
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  JRON CO.
- 305 INDUSTRIAL HEATING Catalog 50, 50 pages—Gives data on the type and size of electric heating units and similar equipment for industrial heating needs. Detailed diagrams and photographs describe applications.—EDWIN L. WIEGAND CO.
- 307 CONDENSATE RETURN SYSTEM— Bulletin 3250—Describes high pressure condensate return systems giving higher heat transfer rate, lower fuel cost and increased boiler capacity.—COCHRANE CORP.
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  and applications of Cottrell electrical precipitators for the collection of solid and
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Continued on page 110

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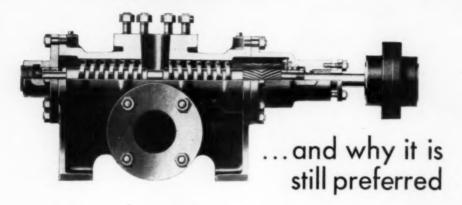


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### ···the <u>Original</u> Screw Pump



100% Anti-friction bearing equipped. Due to their rolling action and minimum lubricating requirements, anti-friction bearings maintain their original clearances without appreciable wear. No hydraulic shock or discharge pressure loads on the bearings because Warren-Quimby Screw Pumps are 100% balanced axially.

Quadruple non-slip screws. A specially generated curvature is now used, producing a straight line contour between screws, essentially eliminating all slippage between these elements. Closer clearances without metallic contact insure higher efficiencies over longer periods.

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The most complete line of Screw Pumps in the industry.

Insist upon the original...now owned, manufactured, marketed, serviced and guaranteed by Warren...one of America's pioneers of the pump industry. Write for bulletin S-204.



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Streight-How Port Design reduces fluid turbulence to a practical minimum.



Seat Rings of end-seated type are screwed into the body.



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# iron body gate valves

with screwed or flanged ends



. 8 Outstanding Features

For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.



Bress Liner on Glands assures greater resistance to corrosion and scoring.

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valves and fittings

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T-heed Disc-to-Stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.



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Solid Web Type Disc in OS&Y valves for greater strength and longer service.



Hinged Gland Eye-Belts on OS&Y valves permit faster, easier repacking under full pressure.

# VULCAN Automatic Sequential

### for PALATKA STATION

#### of FLORIDA POWER and LIGHT COMPANY



Effective boiler cleaning at low cost was demanded for the new Palatka Steam-Electric Station of Florida Power & Light Company. Vulcan will deliver these benefits. Effective boiler cleaning will be a simple matter of pushing one button. Each blower will then work in correct sequence, applying the right amount of steam at the velocity needed. Steam will be saved, because each blower will operate for exactly the correct time. Labor will be saved, because operators will not need to climb to remote locations. Maintenance costs will be low, because each Vulcan unit is designed and built for easy inspection and repair or replacement. Write for Bulletin 483-Automatic Sequential Soot Blowing.

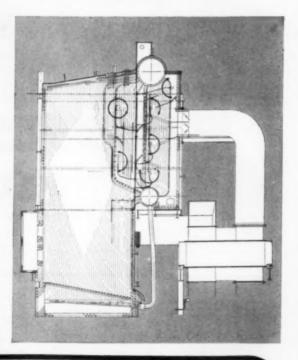
#### VULCAN SOOT BLOWER DIVISION

CONTINENTAL FOUNDRY & MACHINE COMPANY

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Pushing one button at the control panel starts the automatic sequence. Each blower signals that it cuts in and operates correctly. Operation of individual blowers can be skipped or repeated without leaving the panel.

Boiler by Combustion Engineering-Superheater, Inc.
Type of BoilerVUX
Capacity350,000 pounds per hour
Operating Pressure
Total Steam Temperature900 F
Fired withOil; provision for future use of coal
Consulting Engineers Ebasco Services, Incorporated





VULCAN Automatic BLOWERS



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Powell makes valves precisely engineered to suit each and every industrial flow control service.

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Fig. 11303 W.E. Class 1500-pound Cast Steel Pressure Seal Gate Valve with welding ends. One of many Powell designs for Power Plants.

POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio



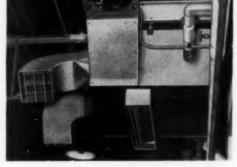
# Settle Next Winter's HEATING PROBLEMS Now!

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Buffalo UNIT HEATERS

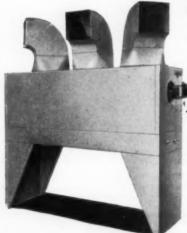
QUICK HEAT FOR SMALL AREAS!

Plan now to wipe out any chilly areas that cramped production last winter. "Buffalo" Breezo-Fin Heaters are very easily installed in suspended position. They operate efficiently on as little as 2 lbs. steam—are available in 20 sizes—have quality Aerofin heater element for maximum radiation and "Buffalo" Breezo Fan for positive heat throw. Now is the time to write for Bulletin 3137-D for the facts!



#### UP AND OUT

Another space-saver is the Suspended "Buffalo" Lowboy Heater, here supplying fresh, filtered, heated air to an entire room. As a window installation this unit is ideal in supplying makeup air for plants using large-capacity exhaust systems. Unit has high-efficiency non-corrosive Aerofin heater element and "Buffalo" mixed-flow fans on hollow shaft.



#### TO HEAT LARGE FLOOR AREAS!

The compact Highboy Heater, with readily adjustable outlets for louvers or duct connection, is simple to install as are all "Buffalo" Unit Heaters. Unit shown is equipped with by-pass damper and the same efficient coils and fans as the Lowboy above. Arrangements and combinations to fit your

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Boiler Plant. . Stone & Webster Engineering Corporation, Engineers.

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"What'll you have?" . . . "Pabst Blue Ribbon!" is a well known slogan. They "have" Detroit RotoGrate Stokers in their new Milwaukee plant, selected for their efficiency and dependability.

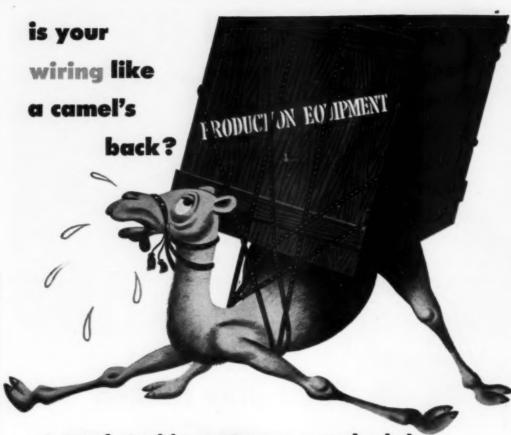
The RotoGrate is an advanced spreader stoker with forward moving grates that discharge the ash continuously at the front. The RotoGrate burns any type of Bituminous coal or Lignite and handles fluctuating loads without loss of pressure. All the steam you want when you want it, because of high burning rates that are possible.

INVESTIGATE THE DETROIT ROTOGRATE STOKER

#### COMPANY

General Motors Building-Detroit 2. Michigan

District Offices in Principal Cities . Works at Monroe. Michigan



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That next piece of equipment you install may be the straw that breaks the back of your plant wiring system—if that wiring is inadequate and obsolete.

Inodequate wiring systems cost money. Every day they're causing cable failures, voltage drops and slowed production in 9 out of every 10 industrial plants. A modern wiring system gives you the full power you pay for . . . and protects you against possible power breakdowns.

Safeguard your production. A strong national defense requires full-scale production and modern up-to-the-minute power wiring systems that can deliver full power.

Make plans to survey your plant wiring system. Call in your utility, plant or consulting engineer or electrical contractor today. And by all means send for your free copy of "Power Up—And Be Prepared." It's a complete guide to modern plant wiring. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.



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### **GULF HARMONY OIL**

#### the outstanding many-purpose lubricant

for: Motors and Generators - Fans - Blowers - Pumps - Compressors - Hydraulic Mechanisms - Gear Units

Gulf Harmony Oil is a top quality many-purpose lubricating oil, ideal for sleeve-type bearings, oil-lubricated ball and roller bearings, hydraulic systems, compressor cylinders, and many types of gears.

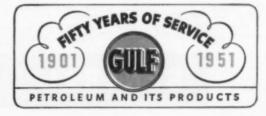
Because of outstanding oxidation stability, Gulf Harmony Oil has exceptional resistance to sludging. In force-feed circulating systems, oil reservoirs, hydraulic lines, and antifriction bearings, the use of Gulf Harmony Oil helps prevent harmful deposits, insures fewer oil changes.

Gulf Harmony Oil provides a protective film which has preferential wetting characteristics for metal—it displaces moisture, interrupts its corrosive action. Thus Gulf Harmony Oil prevents rust on all oil-bathed surfaces—particularly important in antifriction bearings operating under damp conditions. And it separates readily from water, reducing the possibility of emulsification.

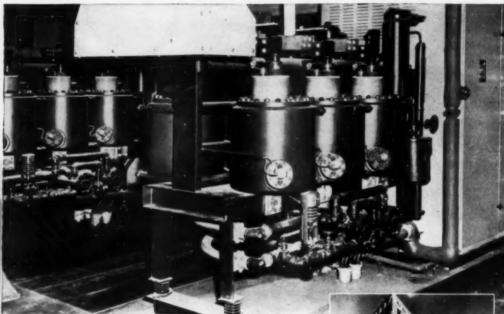
Its high lubricating value means more effective pro-

tection against wear under boundary conditions. Available in a wide range of viscosities.

Write today for complete information on Gulf Harmony Oil. Also ask for a copy of the booklet "Gulf Periodic Consultation Service," which tells about Gulf's advanced cooperative service for users of petroleum products. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh, Pennsylvania.



# World's Largest Store uses 5000-kw Rectifier Installation



#### Macy's replaces d-c generating plant with

#### **G-E IGNITRON RECTIFIERS**

When this famous New York store decided to discard its d-c generating plant and buy power, it had a problem. A considerable portion of its equipment required d-c power but only a-c power could be bought. After considering various methods of power conversion, Macy's chose dependable, proved-in-service G-E Ignitron Rectifiers to supply the 5000 kw of d-c capacity it needed.

The G-E Ignitron Rectifiers operate 24 hours a day, 7 days a week, with minimum attention.

In addition, it gives steadier, constant voltage over the entire load range and higher short-time overload capacity. Supplied as a complete packaged unit with transformer and metalenclosed switchgear, the installation occupies minimum space.

For information on a G-E Ignitron Rectifier to fit your d-c power needs, ask your nearest G-E Sales office for a copy of bulletins GEA-5539 and GEA-5569 or write General Electric Company, Schenectady 5, N.Y.

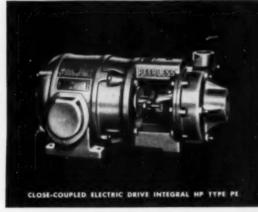


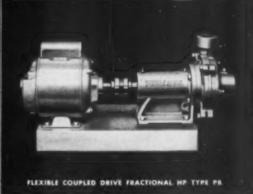
Major portion of the power load of this huge store is supplied by the 5000 kw G-E Ignitron

GENERAL & ELECTRIC

# CLOSE-COUPLED ELECTRIC, BELTED OR FLEXIBLE COUPLED END-SUCTION PUMPS FOR ALL WATER PUMPING PURPOSES







# THE PEERLESS Fluidyne LINE

#### IDEAL FOR CONDENSATE WATER PUMPING, EVAPORATIVE COOLERS, HOT OR COLD WATER AND PUMPING OF OTHER CLEAR MILD SOLUTIONS

Now, more than ever, it's important to specify and buy dependable, efficient pumps for both new and replacement services.

And, now from one of the broadest lines of general purpose pumps offered by any manufacturer, you can satisfy your requirements for both peak performance and prompt delivery, in many sizes, with pumps in the versatile Peerless Fluidyne line, illustrated here.

From the Peerless Fluidyne line, two general types of pumps are available. One type is a close-coupled, electric drive pump, designated as the Peerless Type PE; the other is a bracket-mounted pump for flex-

ible-coupled, V- or flat belt pulley drive, designated as the Peerless Type PB.

designated as the Peerless Type Ps.

Both types are economical both in first cost and in service. Both are built for easy maintenance, if service is required. Both are rugged and compact in design. Both are of good design, fitting neatly into any piping and pumping systems. Both embody superior hydraulic characteristics.

Read the specifications at the right. One or several types of Peerless Fluidyne pumps is sure to match your specifications. And delivery is available from two Peerless factories, located at Indianapolis, Indiana and Los Angeles, California.

#### SIZES:

Type PE HP Range
1/4 to 11/2 hp fractional hp sizes
2 to 60 hp integral hp sizes

Type PB HP Renge 1/4 to 11/2 hp fractional hp sizes 2 to 150 hp integral hp sizes

#### CAPACITIES:

Type PE Up to 65 gpm; fractional hp sizes Up to 1000 gpm; integral hp sizes Type PB

Up to 50 gpm; fractional hp sizes Up to 5500 gpm; integral hp sizes

#### HEADS:

Type PE Up to 110 ft.; fractional hp sizes Up to 200 ft.; integral hp sizes Type PB

Up to 90 ft.; fractional hp sizes Up to 260 ft.; integral hp sizes

#### PEERLESS PUMP DIVISION

FOOD MACHINERY AND CHEMICAL CORPORATION

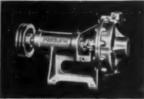
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NEW BULLETIN describes additional features of pumps in the Peerless Fluidyne line. Write for your copy of this 24-page fully illustrated and descriptive engineering bulletin today.



Electric drive fractional HP Type PE

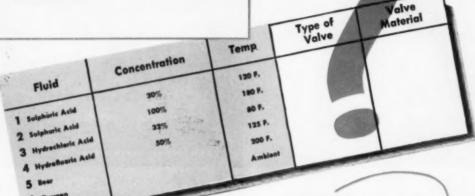


V-Belt drive integral HP Type PB

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# YOU SPECIFY ...



In several of these cases other body materials or diaphragms would serve as well. But the really important fact is the unmatched versatility of Grinnell-Saunders Diaphragm Valves in handling corrosive fluids, gases, compressed air, food and suspended solids . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are problems.

Grinnell-Saunders Valve bodies are stocked in cast iron, malleable iron, stainless steel, bronze, and aluminum, with other materials available on special order. Valve bodies can be lined with lead, glass, natural rubber or neoprene. Diaphragms are available of natural rubber and a number of synthetics to suit particular service conditions.

The Grinnell-Saunders Valve Division will be pleased to submit recommendations upon receipt of complete information covering service conditions.

#### Features of the Grinnell-Saunders Diaphragm Valve

- diaphragm absolutely isolates working parts from fluid
- diaphragm lifts high for streamlined flow in either direction.
- diaphragm presses tight for positive closure
- body, lining and diaphragm materials to suit service
- simple maintenance—diaphragm easily replaced



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Grinnell Company Inc., Providence, Rhade Island

Sales Offices and Warehouses in Principal Cities

pipe and tube fittings \* welding fittings \* engineered pipe hangers and supports \* Thermolier unit heaters \* volves Grinnell-Saunders diaphragm valves \* pipe \* prefabricated piping \* plumbing and heating specialties \* water works supplies industrial supplies \* Grinnell automatic sprinkler fire protection systems \* Amco humidification and cooling systems Can you afford to waste what Iron Fireman users are saving?



for power, processing

1. Iron Fireman Radiant "Inshot" Gas Burner This low pressure burner has an efficient firing range of 10% to 100% of capacity, making it a particularly effective burner for modulated firing. Opposed gas jets and an improved method of air entrainment produce an intense radiant flame. Capacities range from 6 to 500 boiler h.p.

2. Iron Fireman Vertical Type Gas Burner
This gas burner is readily adaptable to a wide range of
firebox dimensions and is easily installed in any conventional boiler setting. Zone fire control permits low-fire
start and modulated firing. Low pressure gas. Capacities
from 6 to 500 boiler h.p.

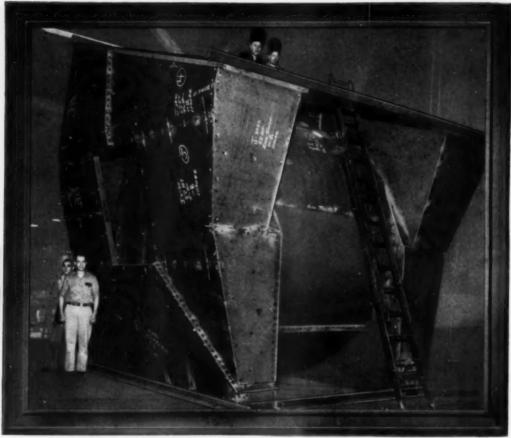
3. Iron Fireman Gas-Oil Combination

Iron Fireman Ring Type gas burner combined with Iron Fireman Horizontal Rotary oil burner permits quick fuel change to meet sudden emergencies, or avoid interruption during daily or seasonal gas shortages. Can also be combined with Iron Fireman Pneumatic Spreader stoker. Capacities up to 500 boiler h.p.

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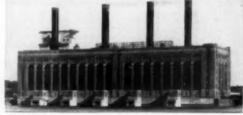
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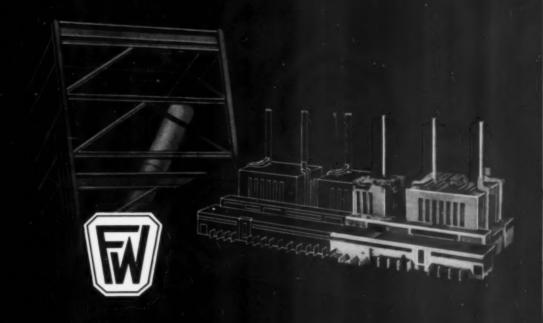
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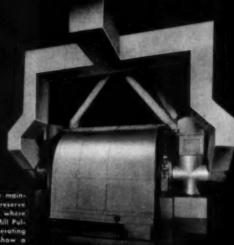




team in this country designs engineers and fubri-ates convection and radiant type superheaters singly in combination SUPERHEAT CONTROL over 8 wide and range is also affered as a means of positive and accurate control of final temperature.

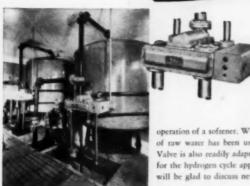


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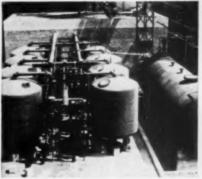
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The new Belco Camomatic Valve completely eliminates the rubbing rotor, slam-action, high pressure loss and the stuck plug. No twisting, tortuous passages so pressure loss and corresponding pumping costs are at a minimum. Seats and discs are interchangeable. Simple construction enables any mechanically minded operator to make the replacement in a few minutes without breaking any pipe lines. Its smooth action requires only a small fractional h.p. motor. The Belco Camomatic Valve replaces the seven individual valves which are required for normal

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No pressure is transmitted to the stuffing box of a Chapman List 960 when the valve is in the open position...you can always repack it easily, fast, without stopping the flow through the valve. What's more, it's a tougher — more rugged — valve that reduces many other maintenance problems.

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Write today for detailed technical information. The Chapman List 960 is available in sizes from 1/4" to 2", either metal to metal or gasketed joint. Rising stem with yoke (as illustrated) or rising stem inside screw type. For pressure range 2000 lbs. at 100 deg. F., 380 lbs. at 1000 deg. F. For higher pressures specify List 990.

# The Chapman Valve Manufacturing Company

INDIAN ORCHARD, MASSACHUSETTS

# **Timely Comments**



# "Southeast Unlimited" and the "Texas Coast Boom"

We are still out of balance

IMPRESSIVE as the growth of Southern and Southwestern industry has been in the past decade, we must realize that up until now only the initial steps

have been taken toward converting raw materials into finished products. We are in fair shape compared to the rest of the country in food, tobacco, textiles, and petroleum and coal products. The same is true of lumber, furniture and of the industries which use stone, glass and clay. We are holding our own in clothing, printing, rubber and leather.

However, we are out of balance with the rest of the country in respect to several industries.

#### Steel

Robert S. Lynch, president of the Atlantic Steel Company of Atlanta, Georgia, recently emphasized the above thoughts in his comments on "Southeast Unlimited" before the semi-annual Atlanta meeting of the Wire Association. He stated that you can almost pick your category—plants established, new jobs, wages, electric power, number of telephones installed—and you'll find the South and Southwest has led the nation in percentage of improvement during the past several years.

The steel industry has caught the same fever. Mr. Lynch noted that in 1939, steel capacity for this region totaled about 2,830,000 tons annually—or 3.5 per cent of the national total. "This year we have more than 4,900,000 tons—4.7 per cent of present national capacity. And we're still building. It looks very much as if the region as a whole will comfortably exceed 6,000,000 tons of capacity in 1953. That will give the Southern district some 5.1 per cent of projected national capacity." Geographically and statistically, the South is looming larger in the national steel picture.

The "out-of-balance" in the steel industry pertains to the fabrication of finished metal products. However, more steel capacity is on the way—a basis for the development of finished product industries. We have the manpower, climate, power, a huge power potential and raw materials. A Bureau of Census report shows that between 1939 and 1947 the number of production workers in the metal fabricating industries increased 148 per cent in the South and Southwest. Value of manufactured products increased 353 per cent.

Mr. Lynch is confident that we can keep going in this direction and that the South can make its own iron and steel industry large enough to serve the region—burgeoning, as it is, with new consuming industries. However, he emphasized that this can't be done tomorrow and it should not be done in any headlong way which would make unwise use of our national potential in these critical times.

## Chemicals

A new era of expansion is on the near horizon for the Texas Gulf Coast, where chemical plant and equipment investments already approach \$1 billion. Dr. Frederick A. Beuchel, nationally-known economist and now head of the Houston Chamber of Commerce industrial research department, has just completed an area-wide survey of the expanding chemical industry which is a prime factor in the "Texas Coast Boom."

Survey included the belt of land extending about 100 miles inland from the Gulf Coast and extending from Lake Charles, La., to Brownsville, Texas.

Average investment per worker in the chemical plants of the Gulf Coast is \$30,000, with the number of workers totaling nearly 26,000. Total monthly payroll is almost \$9 million with average income per worker being nearly \$350.

Dr. Beuchel emphasizes that the remarkable thing about the chemical industry in Texas is that so much has been done in such a short time as compared with industrial advances in older industrial areas elsewhere

However, much more can be done toward converting raw materials into finished products. Although Texas has a large proportion of the plants, investment and production capacity in the synthetic rubber industry, it has only a very small share of the tire manufacturing capacity of the country.

In plastics and chemical intermediates, Texas has the basic materials in quantity and quality, but these intermediates, to a large degree, are being shipped outside Texas as finished goods.

In only a few cases are the chemical ingredients which are made in the area in large volume converted into end products in Texas for Texas users—principally insecticides, detergents and fertilizers.

Only the initial steps in industrial expansion have been taken; the potential is unlimited.

# Continental SCREW CONVEYORS



HELICOID AND SECTIONAL FLIGHT SCREW CONVEYOR



RIBBON CONVEYOR



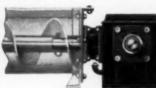
COUPLINGS



CAST IRON OUTSIDE PATTERN



BOX END WITH FEET



ENCLOSED COUNTERSHAFT BOX ENDS



FABRICATED STEEL BOX END WITH CONTINENTAL SKF PILLOW BLOCK, AND SPLIT DUST SEAL GLAND

TROUGH

Continental Screw Conveyors are manufactured in all types, and are favorably known throughout the trade. Standard Parts can be shipped from stock. When complete installations are re-

quired consult Continental Engineers. We also manufacture conveyors for special applications. Send us your orders.













Industrial Division CONTINENTAL GIN COMPANY Birmingham, Alabama

# **Industry Speaks**

# Small Business "Big Cog" in Progress

Adapted from a recent talk by Mr. Granville M. Read, Chief Engineer, E. I. du Pont de Nemours & Company, before the Bedford, Virginia, Chamber of Commerce.

THE Du Pont Company is building a plant for the Atomic Energy Commission on the Savannah River near Augusta, Georgia. Under the contract the Government will reimburse the Du Pont Company for all costs and above those costs they will receive \$1.00.

### **Gigantic Program**

Government authorities do not place the major responsibilities for defense contracts on large corporations because they have any peculiar affection for big business: nor does Government lack confidence in small business. The objective is simply to get the job done quickly and effectively by whatever business units are best suited to do the job.

"A large company is selected to handle a large job because it has the resources and organizational experience to muster and direct manpower and technology from hundreds of different sources and funnel them all into the project.

"At the Savannah River A.E.C., project we must have the help of thousands of small contractors and sub-contractors to carry out this gigantic program. We plan to sub-contract approximately 40 per cent of the total labor requirements and will use small sub-contractors on a great variety of types of construction such as excavating, grading, piping, electrical work, etc.

### **Subcontracting Policy**

"Our policy in contracting work has always been based on economic considerations, schedule requirements, available time for security clearance of personnel and evaluation of the potential ability of the sub-contractor to perform effectively and to get the job done on time.

### **Typical Contract**

"A purchase contract was recently awarded for furnishing and installing boilers at the plant site. The principal sub-contractor who received the boiler contract is currently in the process of letting out sub-orders to suppliers for structural steel, boiler tubes, control instruments, soot blowers, steel plate, pulverizers, insulation, fuel burning equipment, motors, etc.

"These sub-orders will number at least 300 and will go to various contractors, and in turn each of these will have sub-orders totaling in the neighborhood of 2500 in this particular case.

particular case.



Granville M. Read Chief Engineer, Du Pont Company

"For example, the suppliers of structural steel will have sub-orders for such things as trucking, bolts, rivets, welding rod, paint, oxygen, acetylene, etc. The suppliers of other prime components will likewise sub-contract. So it goes on and on.

"You can see that the small business man in a large project is really the "big cog" in the gears of progress. Du Pont just simply could not run the Savannah River job without the small business man.

"True, as you might expect, a large proportion of our sub-contracts have gone to companies that must be classified as "big business." After all, the capital resources required for the maintenance of inventories, tools, and equipment is large indeed. There must be an extensive organization of manpower, technical know-how, and operating skills.

"But I fhink you will be agreeably surprised at the scale of small business participation in the Savannah River project. Since the start of this project until the middle of last month, some 2900 plant site purchase orders have been placed with 821 suppliers. Analysis of the orders discloses that about three quarters (74.5%) went to "small business" suppliers; the remaining quarter (25.5%) to suppliers who could be classified as "big business."

# Economics

"This analysis once again confirms a fact with which you are well familiar, namely, that an industrial project gives an economic 'shot in the arm' to a wide cross section of business in the areas surrounding the project. Of the 75% of the plant site orders which went to small business, approximately 9 out of 10 of these orders (92%) were held by small enterprises in the Southeast."

# Cooling with Steam

By WALLACE R. EVANS

Air Conditioning Engineer Celanese Corporation of America Rock Hill, South Carolina

Steam can be used as a medium for cooling conditioned air. Check these systems—they are new and progress is being made every year.

STEAM JET SYSTEMS—In the two-jet refrigeration machine at the left, jets are at top and mounted horizontally. Tank below jets is condenser; vertical tank is evaporator. The single jet refrigerating system, shown at the right in these Graham Manufacturing Co. illustrations, is mounted vertically outside the plant. It is simple in construction, weighs little, and has no moving parts.

#### Methods:

- 1. Steam Jet System
- 2. Turbine Driven Centrifugal Compressor
- 3. Lithium Salt Absorption System

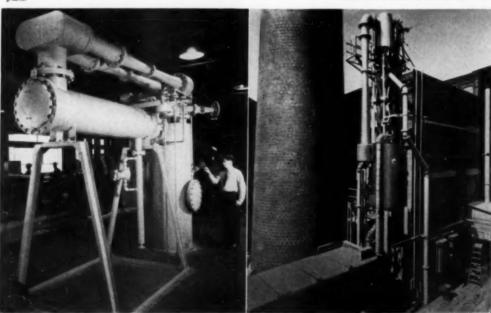
#### Economics:

Assuming that the system needed is large enough, the really determining factor is the cost of steam and water.

In computing the cost of steam, consideration must be given to the fact that in most instances boilers are large enough to provide all of the steam needed for cooling in summer if they are large enough to provide heating in winter.

Cost of steam should be figured on a basis of cost per pound when the boiler is operated at the increased load—a figure which is much lower than the cost when the boiler is operated at part load for process steam alone.

MANY Southern industrial plants keep a boiler burning summer and winter. When the boiler was purchased, its size was calculated according to the combined demand for process steam and hot water in the summer and



the additional heating load in winter. This means that all during the summer, with the reduced load, steam costs are higher per pound of steam, for the boiler is operated at only a fraction of its rating and consequently at a low overall efficiency.

If some good use could be found for steam in summer, the unit cost of steam could be kept at the low winter rate all year around and one obvious use for steam is for cooling the plant. In other words, the steam used in winter for heating may be used for cooling in summer. Steam lines from the boiler to the plant are already in place, no wiring or additional transformers or switch-gear are required, and the use of steam for cooling brings about a plant heat balance that is economically sound.

There are limitations in the use of a steam operated cooling system. Generally speaking, if less than 100 tons of refrigeration are needed to cool the plant, it is best to stick to an electric motor driven compressor. In the smaller sizes, the mechanical compressor unit is usually most desirable, but it might be economically feasible to do more cooling and go to steam.

For example, a plant may find that they require cooled air for only certain areas, so far as process demands are concerned, and they find that this would take about 85 tons. This would indicate that they should use a system with an electrically driven compressor. While not absolutely needed for the process, it is agreed that it would be desirable to cool the rest of the plant for comfort if nothing else. Cooling the whole plant might take 125 tons or perhaps more. It is possible that by using steam for cooling, the operating costs would be less than for cooling only required area with a motor driven compressor. The economics of this would depend primarily on the cost of power purchased and the cost of steam per pound with the boilers operating at the full load of process plus cooling steam. These are not hard figures to come upon, and they are well worth investigating.

#### Methods

There are three principal ways of using steam for cooling of large

# Don't Overlook These Possibilities

Electrically driven compressor units have been so successful and their acceptance has been so great that plant engineers have hardly had the opportunity to see all the factors involved. Now that the manufacturers are seeing possibilities in jets and in lithium salt, we can be certain there will be more steam units installed every year.

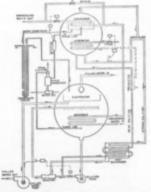
industrial areas. They are (1) steam jet systems, (2) turbine driven centrifugal compressor, and (3) the Lithium salt absorption system. Each of these has some inherent advantages, and each has disadvantages. The choice of the proper system for the particular job is one that must be made after consideration of all factors by an engineer experienced in the field.

## Steam Jet System

This system is simple in construction. The cooling system consists of an evaporator (a closed tank), a set of steam jets, a condenser, and a circulating pump. Water is sprayed into the evaporator, steam jets are used to pull a vacuum, and the cooled water, which is collected in the bottom of

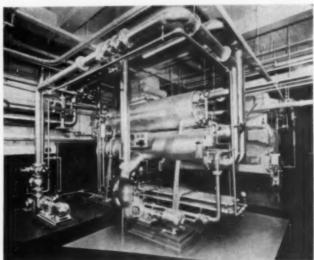
the tank, is pumped into the area to be cooled. The temperature of the cooled water is determined by the amount of vacuum in the evaporator, the lower the vacuum, the cooler the water. Correspondingly, the more steam used through the nozzles of the jets, the lower the vacuum. Therefore, the more steam used, the more cooling which can be accomplished.

For example, a vacuum of about



LITHIUM SALT ABSORPTION SYSTEM

—An operational diagram is shown
at the right. A Carrier Corporation
installation is illustrated below. System depends only upon a source of
heat for operation. Low pressure
steam is a good heating medium.



# Southwestern Applications

The Southwest, with its low cost fuel, is literally cooling with heat with numerous high temperature absorption refrigeration machines.

A well engineered installation that is giving excellent service was featured in the January '51 issue of SOUTHERN POWER & INDUSTRY. In the United Gas Corporation building in Houston, Texas, a Carrier Corporation absorption refrigeration machine replaced five 27-ton units, which

previously furnished summer air conditioning for a portion of the building. While producing 200 tons of cooling effect, the single unit occupies but one-half the area required by the five small units that gave only 135 tons in cooling equivalent.

Placed in operation in June of 1949, the unit's performance during the past two summer seasons has been satisfactory on the specific job it was designed to do.

12" of mercury in the evaporator corresponds to a cooling water temperature of 60 F. A vacuum of about .2" corresponds to a temperature of 36 F for the cooling water. The desired temperature of the cooling water is maintained by holding the vacuum corresponding to that temperature.

The system also requires a condenser to condense the steam from the nozzles of the jets and a considerable amount of cooling water for the condenser.

The first cost of this system is low when compared to other cooling systems. Its simplicity keeps maintenance costs down to the point where there is practically no maintenance except for keeping the system clean. The nozzles are long lasting and need replacing perhaps once in ten years.

Operating costs of the steam jet system are comparable to other systems using steam if the system is operated at or near the peak of

its performance curve. It is something like a gasoline engine in that it has a specific point for maximum economy. Operate it either above or below that point, and costs go up. The nozzles in the jets must be designed for an optimum steam flow, and if the flow is much changed from this point, efficiency drops off rapidly. It is possible, of course, to control the air temperature in the conditioned area without changing the flow of steam through the nozzles. It is also possible to cut off one or two nozzles to reduce steam consumption for decreased demand. This will accomplish all of the regulation and give all the flexibility normally needed, but it is true that the jet does not have the full flexibility at peak economy that may be had with certain other systems.

In selecting a jet system, the temperature of the condensing water should also be considered. The lower the temperature of the condensing water, the more economical the operation of a steam jet system.

It is also recognized that the jet system is best adapted to cooling where the conditioned air is desired at above 55 per cent relative humidity. Also, it should not be used where low air temperatures are required. Low air temperatures (below 70 or 75F) require a very cold coolant, and it takes too high a vacuum to get such low coolant temperatures. The chilled water used as the coolant can be brought down to 50-55F or a little less with ease, but to bring it much lower would be expensive.

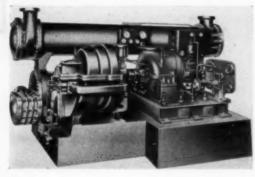
The steam required for the system should be at 50 psi or over, but most industrial boilers can handle this pressure.

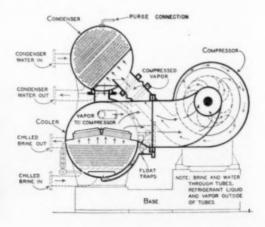
A point, and sometimes a major point, in favor of this system lies in the fact that it weighs little, has no moving parts, and requires no more foundation than the building in which it is located.

### Turbine Driven Centrifugal Compressor

This system is identical to the standard reciprocating compressor system which uses a refrigerant for cooling except that the compressor is of the centrifugal type and is driven by a steam turbine. The only difference between this and the small, standard system is in the equipment used to compress the refrigerant and the type of refrigerant used. When the demand is above 100 tons of refriger-

TURBINE DRIVEN CENTRIFUGAL COMPRESSOR—Turbine is at right and compressor at left. This is the same as the electric motor driven centrifugal refrigeration machine except that the compressor is driven by a steam turbine rather than an electric motor. Diagram of a centrifugal refrigeration system is shown at the right.





ation per day, a centrifugal compressor is usually recommended by the manufacturers of such equipment. If steam is available, there is usually no reason it should not be used to drive a steam turbine directly connected to the compressor. The only point to consider here is whether a steam turbine is the most economical drive.

If steam is available at 50 psi or above, the turbine is well worth considering. Its first cost is more than the steam jet system, but it is usually more economical to operate. It requires little maintenance, but when it does require repair, it takes skilled help.

The turbine used can be either a condensing or back pressure type with process steam taken from the exhaust. The back pressure type is frequently selected for plants using process steam. The steam to the turbine is at perhaps 100 psi, and it turns the turbine and exhaust at 15 psi to be used as process steam. Steam from the turbine can be used for any plant process work.

If a condensing turbine is used, the condensing water can be run first to the refrigerant condenser and then to the turbine condenser. Using the same water for condensing both the refrigerant and the steam, it is possible to get by with less water than is required for either of the other cooling systems operated by steam. If cooling water is costly, this is worth consideration.

This makes a completely flexible system, and when there is a wide variation in the demand for cooled air, it may well prove to be the cheapest system in the end. This is especially true if an economic study shows that steam and water costs are relatively high.

#### Lithium Salt Absorption

The lithium salt absorption system is new. Not too much can be said about it so far as industrial experience is concerned. All that it needs to operate it is heat—heat from any source. Quite a number of these systems have been sold in the Southwest where natural gas is a cheap fuel. They appear to be doing very well. Where steam is available at a reasonable price they are without doubt worth consider-

ing seriously, and there is some reason to believe they may often be the wisest choice for an industrial system.

The lithium salt is in a solution which absorbs moisture. Without going into the details of the system, the cooling cycle may be explained by stating that cooling is brought about by the absorbing quality of the chemical, but that in the process, the solution picks up moisture. To reactivate the lithium salt solution, this moisture must be driven off. Heat is used to thus concentrate and reactivate it.

Steam is a source of heat, and this heat is used to concentrate the lithium salt. Nothing else is needed to power the system.

The equipment is an enclosed, self contained unit constructed in

much the manner of a heat exchanger. The lithium salt solution is sealed in and does not "wear out." Recharging is not required. So far as can be determined, maintenance is low—practically negligible. First cost is low—it is comparable to a steam jet system, and operating costs are probably between the jet and the turbine.

While this system is as flexible as the turbine driven compressor, it probably should not be used where very low temperatures and low relative humidities are required. However, it should be recalled that these systems are new and progress is being made every year. It is wise to talk to a refrigerating engineer before deciding that this system does not go to low enough temperatures.



No, not a soft drink stand or a fair booth. It is a \$4,500 lb "pot" for the reduction of alumina to aluminum pig. This is one of many being fabricated at the Orange, Texas, plant of U. S. Steel's Consolidated Western Steel

Corporation for Kaiser Aluminum and Chemical Corporation's new aluminum reduction plant near New Orleans. Consolidated Western is also fabricating and erecting all structural steel for the Kaiser plant's buildings.

# Consolidated at Orange, Texas, Fabricating Steel for Kaiser's New Orleans Operations

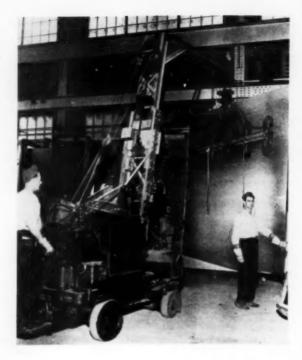
THE shops of Consolidated Western Steel Corporation's big plant at Orange, Texas, are in high gear turning out the greatest single steel fabricating job in the history of that

U. S. Steel subsidiary's Texas operations.

The job is more than 52 million lb of fabricated steel for Kaiser Aluminum's huge new plant.

### INDUSTRIAL TRUCKS

Fitted with a vacuum pump and vacuum clamps, this electrically-powered crame truck, is utilized for the placement in, and removal from, storage of large sheets of rough plate glass at Works No. 9, of Pittsburgh Plate Glass Company, Crystal City, Missouri. Such sheets are deposited either on special A-frame trailers in a vertical position, or flat in other types of special trailers for transport to finishing operations.



# MATERIALS HANDLING

# Pittsburgh Plate Glass Company Works 9...Crystal City, Missouri

EXTENSIVE use of storage battery-electric industrial trucks, of various types, have been made for many years at Pittsburgh Plate Glass Company's Works Nc. 9, located at Crystal City, Missouri, the first use of such type powered trucks here dating back to 1914. One of the two original trucks still is in daily service although it now

has been assigned to the use of machinists in one of the plant's divisions, instead of being utilized for movement of plant product.

Works No. 9 where mirror glass, store-front, show-case, tempered and laminated (safety) automotive glass, as well as curved sheets cut to purchasers' specifications are manufactured, has been operated by Pittsburgh Plate Glass Company since 1895. Since that time it has been rebuilt and expanded until today it is one of the most modern factories in the United States for the manufacture of plate glass. It covers about 85 acres, some 20 of which are under roof, and furnishes employment to an approximate 2.800 persons. Steam



This storage battery-powered tractor — purchased in
1929 — hauls a special type
of trailer containing a load
of rough plate glass from
storage to the start of operation that will turn it into miror glass or into one of the
other types of glass produccd at the plant. Workers who
handle the rough glass ride
the tractor to destination of
the load.

for power operations has been replaced by electricity, while natural gas has replaced coal as fuel for the furnaces.

The Laminating Division, which began operations in 1935 is, in essence, a factory within a factory. Here glass is cut by pattern into shapes for automobile windows, and plates are laminated with a plastic to form non-shattering safety glass, with a still newer section devoted to the manufacture of Herculite, a glass which is tempered by heat to give greater strength, and is bent to shape for use in most modern, streamlined types of automobiles.

Glass is not the only item that is handled by powered industrial trucks at Works No. 9. Sacks of lime and soda ash, used in glass manufacture, are received in 50,-000 and 60,000 lb lots at frequent intervals. These sacks are palletized at car door and are moved by fork trucks into warehouse area. The unloading warehousing job which formerly took between two and two-and-a-half hours for a car, now is done in approximately 45 minutes by two men. Boxes, and crates, in knocked-down form, also are received in huge lots at frequent intervals and these, too, are handled by the powered industrial trucks. All handling within the plant, so far as is possible, is done by industrial truck. The glass as it is manufactured is moved by conveyor until it is cut. Then the rough sheets are moved to the grinding and polishing machines largely on special frames. In storage the huge rough sheets are handled by a powered crane truck which has been fitted with a vacuum pump and vacuum clamps.

#### Equipment

Early in 1950, the powered industrial truck fleet at Works No. 9, consisted of some 15 battery-electric trucks, 14 driver-led, battery-electric hand trucks of the platform and fork types; several units of the gasoline-electric powered type and several gasoline-powered trucks, the operations of the latter trucks being confined to yard and warehouse use.

Under plant safety rules only battery-electric powered industrial trucks are permitted to work in



Two special A-frames, each containing several large sheets of rough plate glass, are towed across outdoor area from storehouse to start of finishing operations, while a crow of handlers rides the tractor.

and out of railroad box cars in unloading or loading material. This is to eliminate fume hazard to operators.

Two battery-electric trucks of the tractor type, each of 4,000 lb capacity and each acquired in 1929, are used daily in the transport and movement of special A-frame type trailer-loads of rough plate glass. Other battery-electric trucks of the platform type, both lowlift and highlift platforms, are used in the transport of skid-loads of material including tank refractories or loads of automotive size plate glass. Tiering trucks, of the fork type, and crane trucks, also are utilized.

In the movement of rough glass in large sheets, the tractor pulls

the trailer-loads and also carries the men assigned to the handling of the loads. The smaller, platform and/or fork trucks, carry only the operators.

A new system of handling materials involving the use of the powered trucks, was set up at the time the existing system at Works No. 9 was surveyed early in 1950, and a new shipping center, with floor area of some 62,790 square feet, was laid out, as well as a new maintenance and repair, and battery-charging department. This latter was constructed large enough to permit housing the entire fleet of powered industrial trucks, and incorporates the newest in battery-charging and changing equipment.

This lowlift platform, battery-electric truck was placed in operation in 1924. The operation above was photographed in mid-1950. The truck sees daily use as does the plant's oldest truck, purchased in 1914. This load of tank refractories was palletized on receipt and placed in

This load of tank refractories was palletized on receipt and placed in storage. When requisitioned for use, a fork truck picked up the pallet load and placed it on a skid for this 6,000-lb. capacity platform truck to move to destination.



# **Diesel Cuts Generating Costs**

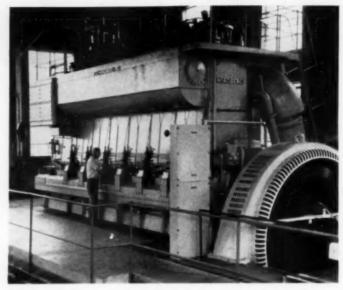
Harrisonburg, Virginia is installing its second large Diesel powered generator on the basis of savings shown by operation of the first unit as reported here.

HARRISONBURG is located in the heart of a prosperous agricultural region and has grown steadily and rapidly to its present population of 11,000. The electrical system has 3,900 accounts and serves an estimated population of 13,000. Bolstered by many feed mills, creameries, an ice plant and other industrial consumers, the load has risen to a peak of 5,200 kw and there is every reason to anticipate further growth.

Harrisonburg started municipal power production in 1904 when it converted an old flour mill site into a hydro electric station, and additions in 1914, 1917 and 1930 brought the hydro station to its potential capacity.

To meet growing demands, a 500 kw steam plant was put into service in 1923, and subsequent expansions included a 1000 kw turbine in 1925 and a 2000 kw turbine in 1937.

An exhaustive study was undertaken to determine the city's long-range power policy, to find means of handling the rapidly expanding load and to reduce power generating costs. The two alternatives offered were modernization and expansion of the steam plant or construction of a Diesel plant. Satisfied that Diesels would provide both lower capital investment and lower operating costs, the city voted for Diesel power.



Harrisonburg's base load unit—2400 hp Diesel, 2-cycle, 6-cylinder, 211/2" bore, 29" stroke, 225 rpm.

Implementing the basic decisions. Harrisonburg purchased a 2400 hp Nordberg Diesel directconnected to a 1690 kw Westinghouse generator. The engine is a heavy-duty 2-cycle unit with 6 cylinders of 2112-in, bore and 29-in. stroke developing its rated horsepower at a conservative 225 rpm. The Diesel plant was integrated with the hydro station 101/2 miles from town to permit utilization of available labor and to insure an ample supply of cooling water. The existing transmission line was adequate and presented no problem.

The Diesel was first operated in October, 1949, and its work schedule was stepped up steadily until it reached 24 hours a day operation on February 8, 1950. The unit has operated continuously since that date. The Diesel quickly became the leading producer of the system. In the high production month of March, it generated 840,000 kwh as compared with 618,000 for steam and 528,800 for hydro. At pre-

dicted load levels, the Diesel will produce 10,000,000 kwh a year.

The anticipated economies of Diesel operation have been fully realized. According to L. S. Armentrout, Superintendent of the Harrisonburg Electric Department, "the total cost of producing a kilowatthour with the Diesel averages 9.3 mills including fuel, lube, labor, maintenance, supplies, insurance, interest and depreciation." (see tabulation of costs)

Obviously the hydro plant is the economy leader and is run at capacity all the time for an average production of 5,500,000 kwh a year. At current demand levels, there remain about 17,000,000 kwh for other power sources to provide. Even with Diesel production at 10,000,000 kwh there are still 7,000,000 kwh left for the higher cost steam generation.

#### Second Diesel

In May, 1950, the city council voted to expand the Diesel plant

sufficiently to carry the full load (except for the hydro) and to retire the steam plant to standby service. Another Diesel engine was purchased and will be installed early in 1951. This second Nordberg unit is a 6 cylinder, 211/2-in. bore by 31-in. stroke crosshead type engine rated 2580 hp at 225 rpm. It will be direct connected to a 1825 kw generator with chain driven exciter.

### Economy

Diesel economy has been based solidly on two factors: the efficiency of the engine and its ability to utilize a cheap heavy fuel. Mr. Armentrout reports that the engine produces over 13 kwh per gallon of fuel at 90% load and an average of 12.50 kwh per gallon for the 24-hour run. The fuel used is a No. 5 oil with a viscosity of 262 sec at 100F, 1900 Btu per lb and 7.68 lb per gallon. Costs in this article were figured on a delivered fuel price of \$0.0819 per gallon.

### **Fuel Supply**

The heavy-duty Nordberg functions smoothly on the heavy fuel and there have been no adverse effects on the injection system; but of course, it is necessary to purify the oil before it reaches the engine.

### DIESEL GENERATING COSTS-MARCH, 1950°

Fuel							*		*				*		6			*		\$4,941.42
Lube												×		*			*			122.97
Labor																				
Maint	er	a	n	e	e							*					*	,	×	150.00
Suppl																				
Water				*	*	*														*****
Depre	c.,	,	I	n	t.		á	k	1	Ī	n	g,		×		8	*	4		1,467.32
Total	,			×		*	×		8	*		*		,			,	*		\$7,374.71
Kwh	G	er	ie	er	a	1	e	d				0								848,000
																				.0087

\*Editor's Note:

\*Editor's Note:

The labor cost shown is a prorata part of the total steam, hydro and diesel cost and no general overhead is included.

Actually, nothing was spent on maintance reserve fund for future use.

No percentages were given to show how interest, depreciation and insurance costs were determined, but the figure shown represents approximately 5.9% annually on the desel plant investment. vestment

The Diesel is started on No. 2 fuel and switched to No. 5 in short order. No. 2 is also used in shutting down the engine. The No. 5 fuel is trucked in and unloaded by gravity through a 4-in. line into two 20,000gal storage tanks. An unloading station on a hill above the plant makes the gravity flow possible. The same line is used to put No. 2 oil into a 10,000-gal storage tank.

From storage the heavy oil flows by gravity through a meter to a centrifuge, then through an oil purifier with cellulose filtration elements and, finally, to two 275-gal day tanks. There are also bag-type filters on the engine.

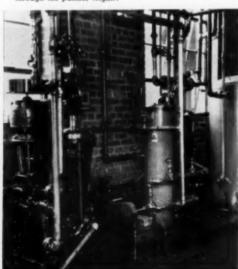
The viscous oil must be heated both for transfer and purification and a system has been devised to utilize waste engine heat for this purpose. Engine jacket water is pumped from a tank by a motordriven centrifugal pump through coils in the exhaust silencer. This flow is regulated by an automatic thermostatic valve to keep the temperature of water leaving the silencer at 250 F. The water flows first to a lubricating oil purifier, then to a heat exchanger to heat the fuel before it enters the centrifuge, then to the fuel oil purifier. Finally the water goes to coils in the day tanks and fuel storage tanks.

Another project promises even greater fuel economy. This Nordberg is a Duafuel engine capable of operating on natural gas with a small pilot charge of oil. At present there is no natural gas available in Harrisonburg but there are gas wells in the region and a contemplated development program would make it available to this power plant. Dual-fuel operation would cut fuel costs substantially.

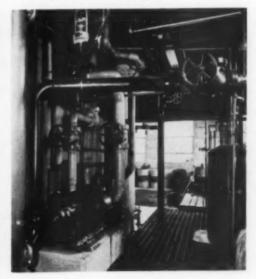
#### Lubrication

A dual system lubricates the Diesel. An individual force-feed

Fuel oil is passed through a centrifuge (left) and then through the purifier (right).



Lubricating oil and jacket water are cooled in an automatically controlled heat exchanger.



# PRINCIPAL EQUIPMENT —HARRISONBURG, VIRGINIA

Diesel engine One 2400 hp. 2-cycle, 6-c 2112-in bore and 29-in, stroke, 225 rpm Nordberg Nordberg Manufacturing Co.
Generator One 3-phase, 60-cycle, 240
508 amp, 2112 kva, .8 pf generator with 25 kw . Westinghouse Electric and Manufacturing Co.
Fuel oil meter
Fuel oil Centrifuge Sharples Corp.
Fuel oil purifier
Fuel oil filters Wm, W. Nugent & Co., Inc.
Waste heat recovery system:
Water pumps
Thermostatic controls Fulton Sylphon Division
Lubricants:
Texaco Algel for crankcase, The Texas Co.
Texaco P 40 for cylinders, The Texas Co.

lubricator supplies oil to each cylinder. This engine, it should be noted, is of the cross-head type. Bearings are lubricated by a pump pressure circulating system. Besides the regular engine-driven lube pump there is a motor-driven pump which is used in starting and shutting down the engine and which cuts in automatically if lube pressure drops. Lube is drawn continuously from the bottom of the engine sump tank by a motor-driven pump and is put through a purifier with fuller's earth filtration elemeats and returned to the sump. In the regular lube circuit there are a duplex strainer and an oil cooler. Customarily, six gallons ofoil are supplied to the cylinders each 24 hours. Since it is rarely necessary to add oil to the crankcase, the engine is running better than 9,000 horsepower hours per gallon of lube consumed.

Individual Inbrientors Manzel Inc.
Oil purifier Honan-Crane Corp.
Motor-driven lube pump Blackmer
Duplex oil strainer Nordberg Manufacturing Co.
Duplex oil strainer Stauthors Walls Corp.
Oil cooler Struthers-Wells Corp.
Cooling Water Pumps Ingersoll-Rand Co.
Thermostatic control Fulton Sylphon Division
Air filters
Pahamet silencer Maxim Silencer Co.
Campagner Co. Gardner-Denver Co.
Switchboard
facturing Co.
Voltage regulator Allis-Charmers Mfg. Co.
Thermometers
Alarm panel
Alarms
Pyrometer
fories, Inc.
Gas valve Kieley & Mueller

## Cooling Water

volt.

For cooling water make-up, rain water is collected from the roof and stored in a 10,000-gal tank. In emergency, water can also be pumped from the river. One 640 gpm centrifugal pump driven by a 20-hp motor circulates cooling water from a jacket supply tank through a heat exchanger and the engine jackets. Another similar pump puts river water through the oil cooler and heat exchanger. An automatic thermostatic control bypasses raw water around the exchangers as necessary to keep lube temperature at 145 F and jacket water at 140 F.

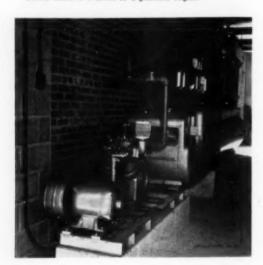
#### Intake Air

Intake air is drawn through duplex oil-bath filters outside the plant and is supplied to the cylinders of this 2-cycle Diesel by a scavenging air pump incorporated in the engine. Exhaust gases vent through a vertical silencer equipped with coils to utilize waste heat as previously described. The engine is started with compressed air supplied by a V-type compressor which can be driven either by motor or by gasoline engine. An automatic motor-control keeps air pressure at 250 psi.

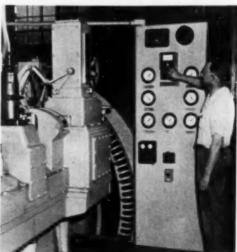
Close to the generator end of the engine there is a control and alarm panel which includes alarms on high and low pressure and high temperature for lubricating oil and jacket water. Also on the board is a multi-point exhaust pyrometer. There is a separate switchboard for the Diesel with a rocking-contact voltage regulator, a synchronizing panel and the usual meters and switches.

Power operations are directed and coordinated by Mr. L. S. Armen-

Starting air is provided by a compressor which can be belted either to a motor or a gasoline engine.



Beside the engine is a compact control and alarm system which includes an exhaust pyrometer.



trout, electric department superintendent, with H. C. McInturff as superintendent of the hydro-Diesel station, R. C. McInturff as assistant station superitendent in charge of diesel operations, and J. L. Whitmire as steam superintendent. Major policy decisions are

made by Mayor L. L. Loewner and the nine-man city council. Management of the electric department is under the administrative supervision of City Manager S. W. Cotten.

In its 46 years of municipal power operations, the city has had experience with three types of power. Policy decisions are based on this experience plus thorough engineering surveys. Success of the present Diesel plant is evidenced by Harrisonburg's decision to place major reliance on Diesel engines for its current and anticipated power requirements.



Engineer's drawing of new \$80,000,000 Aluminum Reduction Plant being built by Reynolds Metals Company on Corpus Christi Bay in Texas on a 2000-acre site in San Patricio County. The two buildings at extreme upper left will house 78 internal

combustion engines totalling 256,300 hp driving direct-current generators with a total rated output of 176,000 kw. Using natural gas for fuel, this will be the largest gas-burning engine plant yet built.

# Huge Gas-Burning Electric Power Plant Scheduled for Reynolds Metals

The reduction plant will have a capacity of 150 million lb of aluminum yearly. This will give Reynolds Metals the capacity to produce 668 million lb of virgin aluminum annually. Approximately 600 workers will be employed. Operation is expected to begin January 1, 1952.

To supply the tremendous electric power requirements in its new 80 million dollar aluminum reduction plant at Corpus Christi, Texas, Reynolds Metals Company is installing 78 internal combustion engines totaling 256,300 hp and driving direct-current generators with a total rated output of 176,000 kw. Using natural gas for fuel, it will be the largest gas-burning engine plant so far built.

One section will contain 40 Cooper-Bessemer Type LSV., 16-cylinder, 3700-hp, 4-cycle engines, each driving a 2500-kw d-c generator. Total output of this group is 100,000 kw. These engines will be approximately 10 per cent more efficient than similar gas engines of a few years ago, since they will employ the modern method of supercharging and air intake cooling.

A second group includes 38 General Motors Model 16-358X 2850-hp, 2-cycle engines, each driving a 2000-kw direct-current generator for a total output of 76,000 kw. These engines are of a new design and this is the first installation of these unique modern units.

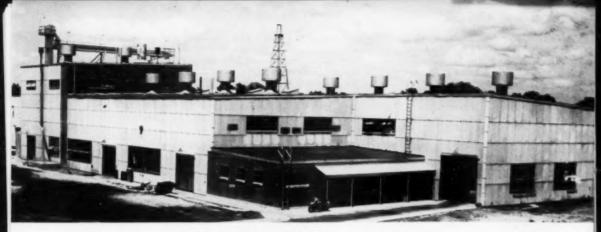
The power plant will consume approximately a million cu ft of natural gas per hour. Some 45,000 gallons of lubricating oil is required just to fill these engines.

### Large Power Consumption

Aluminum production is one of the largest consumers of electrical energy in industry. To make aluminum, approximately four pounds of bauxite is processed into two pounds of alumina which produces one pound of aluminum. But to reduce the alumina to aluminum requires about 10 kwh of electricity per pound of aluminum.

Thus the 176,000 kw developed by this large power plant will permit production of about 17,600 lb of aluminum per hour, or 422,000 lb per day, or 150 million lb per year. Total yearly output of the power plant if operated at full capacity would be well over 1.5 billion kwh.

Earl Murphy will be superintendent of the power plant. He has been in charge of the engine-generator plant at Reynolds Jones Mills Reduction Plant,



Bird & Son's Modern Felt Mill in Shreveport, Louisiana

Serving as an addition to Bird & Son's Shreveport operation, this new mill produces lelt for the asphalt roofing plant. Material was formerly supplied by the company's Phillipsdale, R. I., plant. The L-shaped main building is structural steel cov-

ered with corrugated asbestos siding. It is 300 ft on the long side, 220 ft along the base of the L, and 100 ft wide. All bays are of 50 ft span for uniform construction. Rafters are rolled sections, rather than trusses, for additional headroom.

# **Shreveport Plant Adds Felt Mill**

OPERATING at well over its normal 50 ton/day capacity Bird & Son's modern new felt mill in Shreveport, La., has been helping to supply the Southwestern demand for Bird shingles, roll roofings and saturated felts.

In less than a year, Bird technicians, together with the designerconstructor, The Rust Engineering Company, of Birmingham and Pittsburgh, had the new mill in operation.

A special railroad siding, and six new wells were all part of the Felt, formerly shipped to Bird & Son's Louisiana plant from New England, is now manufactured at Shreveport in this modern 50 ton/day capacity mill. Practically all of the processing and power and steam generation equipment is new.

project. The siding serves to facilitate the inflow of raw materials: wood, rags and paper. The wood is stored near the tracks while rags and paper are stored on a concrete paved area near the beater room.

A 6-in. reinforced concrete slab

covers the 42,000 sq ft main floor area. Standard pre-cast roof slab construction covered with insulation provides minimum maintenance and fire hazard. Fire protection is furnished by a Grinnell automatic sprinkler system. Steel sash is used in the windows and the ventilation system is provided with electrically driven fan ventilators. The entire operating floor is at ground level to keep excavation and building height to a minimum.

A modern locker room, 50 x 30 ft, is furnished with 150 individually ventilated lockers. Red brick outside, this room is finished in yellow

In order to take full advantage of gravity flow, stock and white water storage chests with pumps and agitators are in the basement under part of the beater room and forming section of the felt machine. Basement area is approximately 50 x 92 ft.

glazed tile inside for sanitation and easy maintenance.

A concrete roadway and ramp 156 ft in length extends from the finishing end of the machine room to the roofing plant and railroad loading platform.

Practically all equipment is new except the felt machine which was re-conditioned after being dismantled and shipped from the Container Corp. of America mill at Wilmington, Delaware,

# Water Supply

Six wells, averaging around 90 ft in depth, were drilled on the property to provide 500,000 gallons of water per day. Deep well pumps deliver the water thru a 6-in. line to the mill supply reservoir. This reservoir is a steel tank 18 ft in diameter set above ground from which mill supply pump furnishes the mill with water at 45 fb pressure. By installing a system of Save-Alls, Bird and Son is able to use a large amount of this water over and over.

Unfiltered process water that has been used in the mill and recovered for collection is stored in the unfiltered process water storage chest. To recover usable stock and conserve natural resources, water from this chest is used, whenever possible, in the process. For further use unfiltered process water is passed thru two Bird Save-Alls where stock is removed. The filtered water is then stored in another chest and used wherever possible. Any excess water from this filtered process water chest is discharged to the sewer.

# Power and Steam Generation

A General Electric steam turbine drives the main line shaft of the felt machine. Turbine has a 200 lb inlet pressure and exhausts to the driers at about 75 lb pressure.

A gas-fired Riley 30,000 lb/hr boiler (shown at the right) supplies steam to both the roofing mill and the new felt mill.

Boiler feedwater, bought from the city of Shreveport, is treated in a Zeolite softener. Feedwater is heated by a 60,000 lb/hr Dravo Corporation deaerating heater. Remote reading liquid level indicator enables operator to

# PARTIAL LIST OF PRINCIPAL EQUIPMENT Bird & Son, Inc., Felt Mill, Shreveport, La.

Structural Steel
Roof Slabs
Roofing
Electrical Work
Sprinkler System
Water Softener
Combustion Control
Bust Collector
Liquid Level Controls
Steam Generating Units
Deacrating Heater
Switchgear
Steam Turbine
Electric Motors
Pumps

O'Neal Steel Works, Hirmingham, Ala.
Pre-Cast Slab & Tile Co., St. Louis, Mo.
H. Hain Roofing Co., Shreveport, La.
Electric Contracting Co., Shreveport, La.
Ellectric Contracting Co., Shreveport, La.
Elligin Softener Corp., Pittsburgh, Penna.
Bailey Meter Company, Cleveland, Ohio
American Air Piller, Louisville, Ky.
Mason-Neihan Regulator Co., Boston, Mass.
Riley Stoker Corp., Worcester, Mass.
Dravo Corporation, Pittsburgh, Penna.
I-T-E Circui Bireaker Co., Pittsburgh, Penna.
General Electric, Schenectady, N. Y.
Westinghouse Electric, Pittsburgh, Penna.
Warren Steam Pump Co., Warren, Mass.

# How Felt is Made

The felt furnish is a mixture of rag, waste paper, and pulpwood stocks. Rags are processed in two modern rag cutting machines. Dust from these machines, always a hazard and nuisance, is carried away by an exhaust system to a wet collector. Slurry from the wet collector is returned to the heaters.

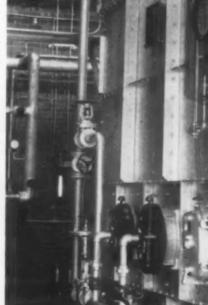
Cut rags travel on a Shields belt conveyor to three rag beaters which have a total daily capacity of 45 tons. From the beaters the fibre is gravity fed directly into the rag stock storage chest below.

Paper is prepared for use in a continuous extraction beater, from which it, too, is gravity fed to the paper stock storage chest in the basement. Enough floor area was left open near this breaker beater to provide room for the future installation of a hydropulper.

Pulpwood is reduced to chips in a 10-knife chipper and elevated to a circular steel storage bin above the semi-chemical cooker. Chips are forced into the cooking chamber by a screw feeder with steam (under 160 lb pressure) and caustic liquor. The partially cooked chips then pass through an Asplund defibrator under pressure which reduces them to fibre which is released through an orifice directly to a cyclone. The fibre is diluted with white water and flows by gravity to the wood stock chest below.

Three chests not previously mentioned are used respectively for storing unfiltered process water, filtered process water, and blended stock ready for final processing and the felt machine. These concrete storage chests vary in size. An average chest is about 23 ft long, 9 ft wide, and 12 ft in depth. All chests have sloped bottoms for better drainage and even stock circulation.

Wood stock and rag stock are refined separately: the former with a



check water level from operating floor.

Boiler operation is controlled by steam pressure which automatically regulates flow of gas to the Coppus burners. Furnace pressure automatically controls the damper on the induced fan outlet.

Electric power for the new mill is purchased from the Southwestern Gas and Electric Company. All relay switches and starting equipment are concentrated in three load centers located in a clean, dry, brick-enclosed room to avoid possible damp mill conditions. This centrally located 25 x 27 ft switchgear room assures uninterrupted, safe operation and provides easy access for maintenance purposes.

Claffin refiner, and the latter with a Bulldog Jordan. These stocks are then combined with paper stock and the resultant stock further refined with a second Jordan. After refining, it is stored in the machine stock chest. This combined stock is later settled and screened before final delivery to the felt machine.

### **Final Processing**

After passing through three Bird screens, the stock goes to the felt machine vat where the cylinder forms the fibres into a sheet of wet felt. The cylinder is 60 in. in diameter and 169 in. long. After the cylinder the wet felt sheet passes through three plain presses which extract part of the remaining water.

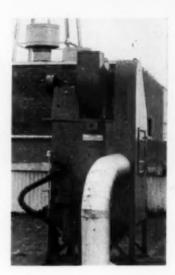
The felt is then passed over 27 driers, each 60 in. in diameter and filled with 75 lb of steam, and through a five-roll calender stack. Following

the calender, the felt is wound on a two-drum reel, one drum supplying the rewinder as the other receives felt from the machine.

An average roll of felt is 144 in. wide and 48 in. in diameter, although Bird & Son make felt up to a trimmed width of 155 in. and a diameter of 72 in.

Driers are equipped with a J. O. Ross ventilating system and hood. The air for the ventilating system is heated with gas line burners which increases the drying capacity and reduces the steam demand on the boiler. Exhaust steam from the turbine is fed directly to the felt machine driers.

An American Air Filter Roto-Clone wet collector is installed on the roof of Bird & Son's modern felt mill in Shreveport, La. Dust from two rag cutting machines, always a hazard and nuisamce, is carried away by an exhaust system to this wet collector.



# Big Three Welding-Houston, Texas

A PPROPRIATELY in an all-welded building, The Big Three Welding Equipment Company has opened new headquarters in Houston, Texas, from which it can expand its services to Southwestern industry.

The new headquarters is a modern layout, engineered and built by The Austin Company. On an 8 acre site, facilities consist of two buildings and a large paved area for parking and handling of trucks. The building illustrated contains offices, an oxygen manufacturing plant and warehouse facilities. The second building houses a self-contained repair operation for overhauling Lincoln welders.

Factory quality repairs will be achieved at production line speed and economy. Gas engine driven welders will be completely rebuilt at a rate of one per hour. This includes complete dismantling, cleaning, repairing, assembling, and testing. Equipment for major repairs will move through the operations on a system of conveyors.

The manufacturing plant will produce both liquid and gaseous oxygen. Gaseous oxygen will be piped at a pressure of less than 200 psi to industries in areas adjacent to the plant. Liquid oxygen will be shipped to other Houston areas and Big Three

outlets throughout Texas. The low-temperature liquid oxygen, shipped by special vessels built into trucks, can be transported for long distances at less cost than delivering gaseous oxygen in cylinders under high pressure.

The warehouse provides space for storing several hundred welders and over 4 million lb of electrode. Fork lift trucks are used extensively in warehouse operations. Electrode is stored under ideal humidity conditions in a 6,000 sq ft area. The high relative humidity of the atmosphere in the Gulf Coast area is reduced inside the rod storage room with natural gas-fired dehumidification equipment to a level that will protect the rod castings indefinitely.

New office and warehouse building of the Big Three Welding Equipment Company headquarters in Houston, Texas. A separate building on the same site houses a production-line service operation. In addition to the Houston headquarters, Big Three has offices and warehouses at Dallas, Fort Worth, San Antonio, Beaumont, Corpus Christi, Brownsville, El Paso, Odessa, Kilgore, Borger and Longview. Company has distributing outlets at Orange and Port Arthur, Texas.



# Carbide twist drills afford higher speeds and increased tool life when

# **Drilling Cast Iron**

Here's what you can do with carbide twist drills. Discussion on production applications has been adapted from recent comments by Fred W. Lucht, of the Carboloy Company.

COMPREHENSIVE laboratory tests, followed by actual production applications over extended periods of time, have now clearly demonstrated that comented carbide twist drills can drill holes in cast iron at least twice as fast as high speed steel drills. At these higher speeds, drill life is roughly three to four times that of steel drills.

In addition, carbide drills can be used to advantage even where increased speeds are not possible. Operating at the same speeds they give a tool life around 10 times that of high speed steel drills.

Excellent results have been obtained by one leading twist drill manufacturer by brazing the tips to the end of regular high speed steel twist drill bodies as one of their regular manufacturing operations. Conventional 118° point angle is ground on the end of the drill at a 12° lip relief angle (illustrated at the left) by using a 180 grit resincid bond diamond cup wheel. It is advisable to first remove both

A typical carbide-tipped twist drill is made simply by inserting a standard carbide twist drill tip in the end of a conventional high speed steel twist drill.

With this type of drill consistently uniform results are now being obtained, using the same drilling equipment as was formerly used with high speed drills. Precautions to be taken, as far as machine and fixture condition are concerned, do not differ from good practice for high speed steel drilling. Prime requirement—if it is desired to take advantage of the increased drilling speeds and feeds

made possible by carbides—would be that the drilling equipment simply have enough power to take care of the increased rate of chip removal.

#### Drills

Carbide twist drills, as illustrated below, have been produced both by carbide tool manufacturers and by tool users who have the necessary but simple brazing and grinding facilities. In the latter case, the users have been purchasing conventional high speed steel drills "over the counter" and then tipping these with carbide before putting them into service.

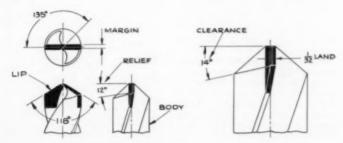
A silver brazing alloy such as Easy-Flo No. 3 is used as the brazing material, as with other types of carbide tools.

An 8° RH spiral at the drill lip increased to a 15° RH spiral for the flutes through the drill body, gives a free movement of chips out of the hole.

### **Drilling Equipment**

Special drill equipment either as to machines or fixtures is not required to take advantage of carbide drills. The same equipment can be used as for high speed steel drills, providing these machines are equipped with power feed and have sufficient power reserve. Speeds or feed rates can simply be stepped up so that increased output is obtained in addition to the longer tool life.

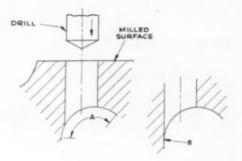
the excess steel and carbide with a silicon carbide wheel by grinding a 14° clearance angle up to a 1/32-in. wide land as illustrated at the right. Longest drill life is obtained when the cutting edges along the drill lip are smooth and keen and without blemishes. Length of the drill lips should be identical. To facilitate a tree flow of chips, drill flutes should be polished.



SOUTHERN POWER & INDUSTRY for JULY, 1951

In this discussion, figures on drill life, etc., are based on actual production conditions. The Carboloy Co. emphasizes that they are quite conservative. Much higher ratios of tool life have been obtained with carbide twist drills.

Here is a setup where the drill entered a cast iron part on a clean surface but left the cut through a rough, scaly and sand-impregnated surface A. In some cases a slight shifting of the cored surface caused the troublesome condition shown at B, which placed excessive wear on drill lips next to the drill margins. With high speed steel drills, drill life varied from zero to 40 holes per drill grind. The carbide tipped twist drill applied to the job under the same conditions, and operating at double the speed for the steel drill, gave 750 to 1000 holes per drill grind, in spite of the bad work condition at B.



It is not good practice, however, to increase speeds or feeds if the motor is overloaded to the extent that it slows down the spindle during the cut. Similarly, clutches should also be checked under these conditions. If an increase in motor load should produce tendency for the clutch to slip, drill life obviously would be affected.

Radial drill presses are well

suited to the use of carbide twist drills for drilling of cast iron. As with high speed steel practice, desirable precautions include keeping spindle end play to a minimum and checking the alignment of drill jig bushings with an indicator if drill bushings are used.

With regard to drill holders, best practice is to fit the drill directly into the spindle socket or into reducing sleeves. Quickchange types of holders can be used, but floating holders are not recommended.

Spindle nose sockets, reducing sleeves and drill shanks should be kept free from burrs to maintain drill alignment with the guide bushings and to keep the drill running true. However, this practice is no different from good practice with high speed steel drills.

# Putting the Drill to Work

Start drilled holes from machined surfaces. This aids in maintaining accuracy of hole location, as with steel drills, and also contributes to longer drill life.

When carbide twist drills are used in setups not employing bushed drill jigs, it is advisable to spot drill. This is good practice when using HSS drills.

Conventional practice of center punching followed by spot drilling is also quite satisfactory for carbide drills. Spot drill can also be carbide tipped so that operator will not have to change spindle speeds on the machine. Carbide spot drills preferably should be as short as possible to insure that the holes will be located in a manner that will give minimum runout. Where this general practice is followed, quick change tool holders commonly used with both spot drill and regular drill fitting the same collet-are quite satisfactory with carbides.

Whenever possible, it is desirable to drill holes in east iron parts from the solid instead of using them to enlarge a cored opening in the casting. Frequently the shifting of cores during the casting operation in the foundry results in an uneven stock removal. This in turn causes a decided drill runout which, combined with the

fact that the drill lips near the drill margin are working in rough, scaly and sandy work surfaces, may result in chipouts and excessive wear. This shortens the drill life of either carbide or high speed steel drills.

When setting up a new carbide drilling job, it is advisable to record the number of holes drilled for a given set of speed-feed conditions for several runs to obtain the trend of holes per grind. Two or three trial runs may be necessary to determine most effective speed range. At no time should the drills be allowed to become excessively dull, thereby causing complete drill failure.

This data can then be used not only to determine best operating conditions but also to indicate the number of holes after which a drill should be removed for sharpening. Usually the best thing to do is to set the drill-change time at 50 to 100 holes less than the minimum obtained in the trial runs. As with other carbide tools, carbide twist drills should be removed for sharpening before they become really dull, if maximum continuity of production and maximum overall drill life is to be obtained.

The consistency with which carbido drills operate when correctly applied, makes this practice entirely feasible. For instance, on a tough job where drills had chipped after runs of 750 holes per grind, no difficulty was experienced when the drills were changed after each 700 holes.

#### Speeds and Feeds

In drilling cast iron with carbide twist drills on conventional equipment, practically any speed in the range of 75 to 200 sfpm gives good results. At the lower—or "high speed steel"—end of the range, tool life is roughly ten times that for HSS twist drills. At the upper end of the range, life is approximately 3 to 4 times that for steel drills running at lower speed on the same job.

There is no necessity for reducing feeds when higher speeds are used with carbide drills than for steel drills. The selection of drilling speed (within the range of the equipment) therefore simply becomes one of balancing the increase in output against the increase in drill life desired.

In general, if the equipment permits, an attractive set of conditions for starting with carbides on a cast iron drilling job is to use the following:

Speed: Twice that for HSS twist drills.

Feed: Same amount per revolution as with steel drills.

Rate of Penetration: Twice that with HSS twist drills.

Tool Life: 3 to 4 times that of HSS twist drills.

Indications are that there should

be some relationship between the depth of holes being drilled and the drill speed used with twist drills having brazed-in carbide tips. Speeds as high as 200 sfpm with .013 feed per revolution have been used while drilling 13/16 diameter holes up to 5½" deep from the solid, without any sign of breakdown of the braze from the increased temperature developed by the longer drilling period and the greater accumulation of hot chips.

For drilling holes much deeper than this, it might be advisable to use somewhat lower cutting speeds (but not lower than for HSS drills) when starting a job—at least until experience has demonstrated that higher speeds will not affect the braze as a result of the increase in operating drill temperature.

Drill feeds between .008 and .013 per revolution have given good operating conditions on quite

a variety of jobs. Lighter feeds are not usually advisable. They seem to contribute at times to an erratic cutting action evidenced by objectionable vibration or "sing." Such vibrations seem to encourage a breakdown.

If a carbide twist drill on a job does vibrate or "sing," best practice is to increase the feed per revolution. In general this will not only give quieter operation but will also increase the number of holes per grind of the drill. In addition, number of grinds will also be increased, usually, since less material has to be removed in sharpening a carbide twist drill that has been operating properly.

In general, it is better practice to increase output with carbide twist drills by first increasing feed rather than speed—particularly if the equipment, operating conditions, or material being drilled do not permit the increasing of both speed and feed.

Output can be increased more effectively (with maximum tool life) for the harder cast irons by retaining the same speed as for high speed steel drills but increasing the feed per revolution.

# **Cutting Oils, Coolants**

Practically all drilling of cast iron parts to date has been done dry since this practice holds the range of temperature fluctuation to a minimum, thus contributing to longer drill life. In those cases where a coolant must be used, a soluble oil solution will be satisfactory. However, the shock from the coolant hitting the hot carbide as it is pulled out of a hole where it was covered with hot chips may reduce the number of holes per grind as well as shorten drill life. Under such conditions, operating the drill in the lower portion of the carbide drill speed-range will lower the cutting temperature and improve drill life.

# Engineers Note New Method for Starting Three Phase Motors

One phase of a three-phase winding is connected in series during the starting period only, the other phases having circuits in parallel. When full speed is attained, series connected winding is opened momentarily, and then put back on the line in parallel.

A NEW method of normal voltage reduced current starting for induction motors was discussed at the American Institute of Flectrical Engineers Great Lakes District Meeting. Authors of the paper on this subject were: P. L. Alger, H. C. Ward, Jr., and F. H. Wright, all of the General Electric Company. According to the authors, "The system gives the advantages of reduced current without any current surge on reclosing, no external impedance, and a low cost of control. It provides about half torque with two-thirds average current, as compared to full voltage

starting; it gives a smooth torque curve on the Y connection, and only a small one-third speed torque dip on delta connection; and it allows about 50 per cent greater stalled time than on full voltage.

"Although this type of connection will draw unbalanced line currents, this appears unimportant. In most cases there will be other machines on the line to act as phase balancers and absorb the relatively small negative sequence current."

The authors concluded "that the split winding method of starting with K-2 (K equals the ratio of the number of turns in series of the unbalanced phase to the number of turns in series on a normal balanced phase) gives fully comparable performance to the usual compensator method with an 80 to 85 per cent tap. It has the advantage of no current surge on transition from starting to running connection of requiring less equipment, and an ultimately lower cost. The method may be applied to any dual voltage motor having 9 leads brought out. Single voltage motors especially built for this method will require only 5 leads brought out.

"As compared to the part-winding method of starting, it has the important advantage of smooth starting on the first position, no current surge on transfer to running position, and adequate thermal capacity.

"The split-winding method is especially adapted to cases where soft starting is desired, without any sudden torque peaks.

"As compared to the reactor method of starting, the split-winding gives greater torque per ampere and requires less equipment and smaller size auxiliary contactors."



# FLOW LINES in American Desk's

Material flow, palletization and power distribution features of American Desk Manufacturing Company's Texas plant producing over 500,000 units of school, church and theatre furniture per year.

Major forming operations are performed on the press shown above. Metal chairs are assembled by spot welding techniques.



Richard Wilcox conveyors carry the parts through a spray booth to a gas fired oven. Conveyor then runs through the open shop to assembly area, providing ample time for the parts to cool.



# By GUY B. ARTHUR

THE flow system in American Desk Manufacturing Company's Temple, Texas, plant was designed to bring the steel and wood parts to the middle of the 100 x 800 ft building for assembly and shipment.

Wood comes from different parts of the country, for all the usual species used in furniture are employed: such as birch, maple, and gum. Some of this is purchased as plywood. Some comes in laminations which are formed and welded into backs, arms, and seats. Steel comes from various sources.

In this unusual plan the raw materials are unloaded from cars on a spur track running the full length of the building. Wood is stored at one end, and steel at the other. All storage is palletized for lift truck operations. Finished products accumulate at the middle of the plant, in an assembling area of 12,000 sq ft. Here they are loaded on railroad cars on one side. A considerable part of the total now goes out on trucks, which are backed part way into the building on the opposite side.

#### **Wood Fabrication**

The wood fabricating department has the usual assortment of machines for flatwork, and also machines for forming and gluing curved parts, the seats, backs and arms. These parts then go through band saws which cut them to finished contours. There is only one straight line on a back or seat. All

# Temple, Texas, Plant

the other edges are curved. Some of these edges are beveled, and the bevels are not always uniform around a curve, so the saw tables are inclined in various ways.

Wooden parts are fastened to the steel frames with bolts, the heads of which are sunk in rust-proof depressed washers. The drilling of these holes is done with the tables level, but on jigs which set the seat or back at the proper angle.

The prevalence of curves becomes most apparent in the sanding operations, where high speed sanding machines employ cones and belts to reach all the surfaces. Much can be said about the skill of workers all through these operations.

Just ahead of the sanding operations girls inspect each plywood piece, and carefully fill any holes in the edges where small pieces of the laminations have fallen out.

After sanding, the wooden parts go to the paint room where each piece is filled and dried. After this the finish is applied in modern spray booths, in colors specified. The most common finish is several coats of shellac to bring out the beautiful natural wood color. Much experience and experimenting has proved that this finish seals the wood against moisture and insures long wear.

Through these steps the wooden parts have progressed from the end of the building along one side of the main aisle to the middle, where they are stored in racks in numbered compartments for assembling.

This same flow line applies to desks of various designs and sizes, but these require more manual handling, more hand work, and gluing. Besides the desk frame there are drawers to be assembled and glued.

Parts for desks and drawers begin their course at the same primary cutting machines, but from then on they progress along the other side of the main aisle as their characteristics begin to take form. Legs are rabbetted for side panels, and drilled for the bolts which fasten the tops. Side panels are cut to size.

Assembling is done in the area in the middle of the long building, and the desks assembled at amazing speed. They are clamped for drying, and drawn out as needed for applying the tops. Sides and bottoms of drawers come along this same line, stacked on pallets.

# Rapid Assembly

As an illustration of the rapidity of assembling, the operation on the middle drawer of a desk is cited.

A woman stands at a bench with drawer parts stacked close at hand. She picks up the front board, which is already fitted with pulls and lock, and lays it face down on the bench. Next she picks up the side boards one at a time, spreads glue on the dovetails, sets them in place, and seats them firmly with a mallet. The floor board is slid into the grooves in the side boards. Last, she picks up the back board, paints glue on the dovetails, and seats it firmly with her mallet. She then pushes the drawer to the back of her bench.

At the far side a man operates a press. He picks up a drawer from the bench, lays it top down in his press, and screws the press up tight. He then paints glue on two spots on each of the side boards, the face and back boards, and sticks the little three-cornered reinforcements in the glue spots, tapping them into place. He releases the press and stacks the drawer in the pile.

By actual count 28 of these drawers were stacked in 25 minutes.

Tables are fabricated here if the legs and frame are of wood. Wooden tops are also added, but most of the tables have metal tops, which are added in the assembling.

All desks and tables are given a filler coat, and then the usual finishes, but these are all sprayed on by hand in this area. None of these products go through spray booths on conveyors.

#### Steel Fabrication

Steel begins its course at the other end of the building, going through shears, punches, presses, and bending machines. Chair legs are U-channels or angles, flared out

Frames for small desks are set on pedestals which can be revolved by the worker's foot. The Jas. Campbell Smith baking oven is shown in the background.



at the bottom, with a turn-over flap for the floor button. Even in steel frames there are few straight lines. Side plates are punched for spot welding. Frames for chair arms are curved in two directions, rounded on the ends, and flanged deeply for strength.

Parts for chair frames are piled beside the spot welding machines. The operator assembles the frame by welding legs and side plates together. The frames are then buffed to remove burrs, and move to a leveling table. This is one of the most interesting operations in the plant. By sundry expert jerks and hammer blows each chair frame is made to stand perfectly level. Then the bolt holes in the back and seat are checked with a template to see that they line up with the drilling of the wood parts.

Each frame is hung on a hook on the overhead conveyor. It is carried first through a phosphoric acid dip to remove all rust and grease, and then into a drying oven. It continues into a spraying chamber where it receives its finish, and into a gas-fired bake oven where the conveyor makes four loops, insuring that the paint is baked dry. From the bake oven the conveyor runs through the open shop long enough to cool the steel parts before they arrive at the assembling area.

At this point each frame is taken off the conveyor and fitted with the wood trim; back, seat, and arms. Some of the units are not fully assembled, but packed with all their parts in cartons. Desks and tables are boxed in corrugated paper. The packing for railroad shipment is a little different from that for

# Power Distribution and Lighting

A supply of wood waste always stimulates thinking about its use for heating or generating power. Here the problem is intricate. It is estimated that the suction system takes out 100,000 cu ft of air a minute, in drawing off the wood waste and fumes. This is a complete change of air every 13 minutes. Such frequent renewal is excellent for healthful working conditions, but hard on a heating system. However, with a plentiful supply of natural gas, the heating problem is not acute.

It would be desirable to generate power with the waste, for power now costs the plant approximately \$2,000 a month. There is now about enough wood waste to heat the plant with a steam system, but only about 15 per

trucks. All cartons are fastened with steel strapping.

The end product is a pile of boxed chairs, tables, and desks, in the middle of the building, ready for loading into box cars on the railroad, or into trucks backed into the wide doors on the other side.

All movement of materials within the plant is by Clark and Towmotor lift trucks and pallets. From raw materials to finished products, carefully marked pallets move back and forth in the plant, serving machines, welders, and assemblers. Only the parts hooked on the overhead conveyor move in any other way. Even the wood and metal waste goes into boxes which are moved outside the building by the lift trucks.

A Matthews suction system is piped through the woodworking and painting departments, drawing cent of the amount needed to generate sufficient power.

Current is now supplied the plant by the Texas Power & Light Company. From the central supply, the distribution system is broken down into four feeders, 120/240 volts, 4 wire, 3 phase, 60 cycle, delta. Three of these feeders are of 1000 amp capacity, using plug-in bus duct furnished by the Federal Electric Manufacturing Company. The fourth feeder, supplying power to the resistance type welding machines, runs in a low-voltage-drop ventilated type bus duct by means of plug-in switches and Flamenol bus-drop cable, giving maximum flexibility.

Plant is lighted with 300 watt incandescent RLP dome reflectors, supplied from these bus duct runs. There is a panel for each of the areas in the building, controlled by a magnetic power starter.

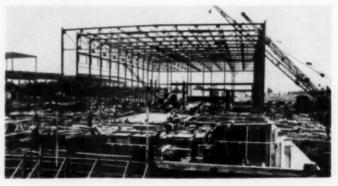
off all fine wood waste and fumes. The building is a steel frame covered with corrugated sheets, with bowstring trusses spanning the width. The piping in the suction system is hung on these trusses, well above the working area, with platforms at all points where pipes are joined from different directions.

### **Design and Construction**

Wyatt C. Hedrick, of Ft. Worth, designed the plant. General Contractors were Quisle Construction Company of Ft. Worth. Steel was supplied by Capital Steel and Iron Company of Oklahoma City, electrical work by Wills Electric Company of Ft. Worth, plumbing and heating by Walter R. Stewart of Waco, and fire protection by Central Automatic Sprinkler Company of Dallas.

# Owens-Corning's South Carolina Plant

This 175,000 sq ft Owens-Corning Fiberglas Corporation plant is being built near Anderson, South Carolina by the Daniel Construction Company of Greenville, S. C. and Birmingham, Ala. Architect and engineers for the plant were Lockwood Green Engineers, Inc., of Spartanburg, South Carolina.



# Refrigeration System at Minute Maid

Water is removed from orange juice at low temperature. Pressure within concentrator is reduced, which reduces boiling point of juice. Temperature never exceeds 75 F and when the pressure approaches 10 MM, temperature is about 60 F. Concentrating equipment can then remove 34,750 lb of water per hour from the juice.

NERVE center of one of the frozen-orange-juice-concentrate processes used at the Minute Maid Corporation's Plymouth, Florida, plant is a refrigeration system of the reciprocating type.

In the process, the single strength orange juice is introduced into specially designed evaporators which liberate the water content. The warm condenser water from the refrigerant side of the system is used as the heating medium for the first effect of the evaporation. A Worthington Pump and Machinery Corporation horizontal multi-pass condenser 38" x 18'0" is the source of this condenser water.

Leaving the first effect evaporator the condensing water is returned to the refrigerant system where a control system is operated to mix some water from a cooling tower to effect a constant temperature available to the first effect evaporator at all times.

The vapor liberated in the first effect, after leaving a separator, becomes the heating medium for the second effect of the evaporation. The water vapor from the final effect after leaving its separator enters a vertical vapor condenser whereby the vapor, through the introduction of ammonia in a conventional manner, is condensed and the ammonia vapor is drawn off.

A special designed Worthington ammonia vapor condenser 46" x 16'0" is used for the all-important function of condensing the liberated vapors. This vessel is designed for proper connection to the last effect vapor separator to

insure vapor flow and the upward feed of ammonia through the tubes to obtain final result. For this process the Worthington Vapor Condenser is complete with a Worthington 42" x 80" surge drum with float controls.

### Compressor

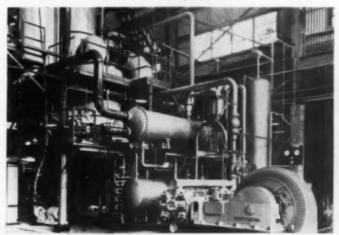
The ammonia vapor is returned to the reciprocating compressor, which is a Worthington 12" x 14" Horizontal Duplex Ammonia Compressor complete with 400 hp synchronous motor. It is the control center of plant for this unit supplies the refrigerating effect neccessary in transferring heat from condenser water to single strength juice, from water vapor to condensed liquid, from ammonia vapor compressed and then condensed to a liquid.

### Receiver

The ammonia-vapor is compressed and goes to a condenser, being converted into a liquid completing the refrigerant cycle. A Worthington 38" x 20"0" ammonia receiver is the last item in the refrigerant system, collecting liquid ammonia from ammonia condenser. This vessel then directs liquid ammonia as a feed to the vapor condenser and surge drum assembly.

The orange concentrate drawn from the final effect of the evaporation is pumped to a blending and mixing system where the concentrate is blended with a predetermined portion of single strength juice to arrive at the proper flavor and proper degree of brix.

The 500-ton Worthington Pump & Machinery Corporation retrigeration system installed at the Minute Maid Florida plant includes a compressor, motor, condenser, receiver and two concentrate pumps.



# **Unitizing For Materials Handling**

The following questions and answers were presented at a round-table discussion "Developing the Unit Load" at a meeting of the Midwest Materials Handling Society. Presiding over the panel was John G. Bucuss, General Manager, Strapping Division of Acme Steel Company, and recently elected President of the Materials Handling Institute. The panel consisted of A. N. Perry, Signode Steel Strapping Company; E. W. Bonekamp, Brainard Steel Company; H. M. Reed, Gerrard Steel Strapping; G. E. O'Brien, The Stanley Works, and E. C. Evans, Acme Steel Company.

One of the best opportunities for industry to make quick and substantial savings is through adoption of improved methods of packing, handling, and transporting the plant product.

UNITIZING means "To securely confine two or more units into a larger unit." This permits economical, safe and easy handling, with maximum protection to the products.

#### Unitizing by Bundling

Q-What formula is used to determine the required number and size of straps to be used for a bundling job?

A—There is no cut and dried formula for this determination. The selection depends on size, weight and quantity of items to be unitized. The available handling equipment and the type of transportation must also be considered. The strapping manufacturers can

usually furnish a definite suggestion based on experience in related fields.

Q—Can empty multi-wall paper bags be bundled for handling with mechanical equipment?

A—Yes. Two rectangular or cylindrical fiber tubes are usually included in the unit, at the proper height. When the bundle has been strapped, the tubes allow fork entry so the package may be handled mechanically.

Q—Can pipe-rods or bars be pulled into a tight circular bundle with steel strapping?

A—Bundles of these products should be formed in a circular jig, or buck. The upper half of the bundle should also have a circular shape. Steel strapping will hold the shape, once it is formed.

Q—Is a double wrap of strapping around a bundle stronger than two individual straps at the same point?

A—Yes. The double wrap of strapping provides a snubbing action around the bundle and offers greater safety than two single wraps. Also, the greater length of strap will absorb more shock.

Q—Is it always necessary to use as many straps around bundles or skid loads which are shipped in carload quantities as when the bundles are shipped L.C.L.?

A—Very often the number of bundle straps can be reduced for carload shipments by proper car stowage and bracing.

Q-What precautions should be observed when placing straps around a unitized load?

A—Stowage should be tight, to minimize internal movement. Steel strapping should confine all, or the majority of the items. It should be placed to bear on the strong points of the cases or products. Corner protectors should be used

Strapped lumber packs permit efficient lift truck handling at mill or retail yard.



under the straps that pass around hard, sharp corners.

# Q-Can economies be made by bundling items such as plywood?

A—Yes. One large plywood company adopted the idea of unitizing large sheets of plywood, reporting a saving of 51% in packaging costs and a 75 lb. reduction in gross shipping weight for a 20-piece shipment. Damage has been reduced and the job made easier by handling large units with fork lift trucks.

# Q—What savings can be made by receiving packaged lumber on flat or gondola cars?

A—About 24 man hours are required to unload 25,000 board feet of lumber from a box car.

When packaged lumber is received on open top cars it requires about 2¾ man hours to be unloaded with mechanical equipment and placed in yard storage.

Industries report savings of 40 to 75%, depending upon package size, yard layout and handling equipment. Air rights in the yard storage may be utilized with greater safety.

### Q—How can "coring," or lengthwise slippage of individual pieces of packaged lumber, be reduced?

A—It can be reduced by placing two or more stickers, crosswise, about every 12 inches of bundle height. Steel strap, drawn to maximum tension, should encircle the bundle midway between vertical rows of stickers.

# Q—Can pulpwood and logs be "packaged"?

A—Both items are currently being packaged with steel strapping. Bundle size depends upon size of wood, handling equipment and method of transportation, whether by rail, truck, deep water tow, or any combination.

# Q—Is it practical to "package" knocked down structures?

A—Automobile truck bodies offer a good example. They are partially assembled with two bodies nesting together and secured by steel strapping. These are illustrated in Figures 212, 213, 214, and 215, in the book "Rules Gov-



Mixed barrel and box "floating load" is bound as a unit with flat steel strapping.

erning the Loading of Commodities on Open Top Cars," issued by the Association of American Railroads.

### Q-What progress has been made in bundling flooring?

A—Generally speaking, 12 pieces of flooring are unitized with steel strapping. Small bundles may be stacked to form a bundle containing about 500 board feet. This is securely bound with steel strapping and the entire bundle handled by fork truck from storage to carrier. Cars are loaded and unloaded easier and faster, with added protection to the product.

### Q—Have "master bundles" of shingles—laths—shook and similar items been developed?

A—Yes. Strapped "sales units" of these products and related items should become more popular, once the savings in unitized handling are fully realized.

### Q-Are there tools available to tension steel strapping around small, or circular products?

A-Yes. All strapping companies have such tools.

### Q—What are the advantages of using a press when bundling paper bags, veneer, chipboard, or similar compressible items?

A—The use of a press is recommended for many jobs. It quickly removes trapped air from the bundle and reduces the time required to secure compression by use of the steel strapping.

### Unitizing on Skids or Pallets

Unit loads are synonymous with unitizing. In addition some products may be unitized, or unit loaded, to permit mechanical handling with or without skids or pallets.

# Q—What is the difference between skids and pallets?

A—Skids and pallets are merchandise-carrying platforms. It is generally accepted that a pallet has both a top and bottom platform separated by stringers, runners, legs or posts. The skid has a load-carrying platform supported by runners, stringers, legs or posts, but no lower deck, or face.

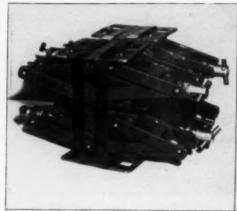
### Q—What are the present methods for retaining products on skids or pallets?

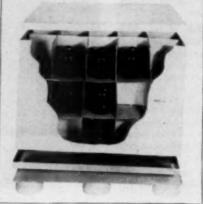
A—Steel strapping, tape, glue and rope are all used to retain products on skids or pallets. Steel strapping is more widely used because it is economical and strong. Easily applied with suitable amount of tension, it has a wide variety of applications. It offers maximum product protection and permits safe, economical handling in transportation and storage.

# Q-What are the advantages of unitizing?

A—It effects reduction in handling costs by permitting more material to be moved in less time:

- (a) through the use of mechanical handling equipment;
  - (b) through more efficient use





Neat Unit-Pak of six "scissors-type" auto jacks is held together by two bands of flat steel strapping.

Celled container of fibre board with aluminum covers is secured to pallet by flat steel strapping.

of warehouse floor space;

- (c) through elimination of individual containers and their individual handling;
- (d) through increased product protection;
- (e) through reduced personal injury hazards:
- (f) through reduction of paper and clerical work; and
- (g) through easier and faster loading and unloading, into and from railroad cars and trucks.

# Q—What factors determine the use of skids or pallets, and their size?

- A—Type of pallet or skid is determined by the size, weight and shape of the individual units to be handled. Other factors to be considered are:
- (a) intra or inter-plant movement;
- (b) rail L.C.L., car load or truck shipment;
  - (c) warehousing:
  - (d) unit of sale;
  - (e) customer reception; and
- (f) materials handling equipment available at origin and destination.

# Q-Are there standard pallet sizes?

A—The National Wooden Pallet Manufacturers Association lists 19 sizes as standard. However, 48" x 48", 48" x 40" and 40" x 32" are quite popular. Skids are of the same basic dimensions.

# Q-What are the most common designs?

- A-Most common designs are:

  (a) two-way, permitting fork
  entry from either end of the
- (b) four-way, permitting fork entry from both ends and both sides; and

nallet:

(c) eight-way, permitting fork entry from both ends, both sides and at all corners.

### Q—How can compressible items and cartons be strapped to pallets or skids?

A—Use steel corner protectors between the strap and corners of the unitized load, and, in some instances, vertical strips of lumber under the straps.

# Q-How can small items be palletized?

A—They can be palletized by the use of trays for each layer which may or may not have cells similar to egg crate separators.

# Q—How may small spools of wire be palletized?

A—Place the spools, with their cores vertical, on the pallet platform. The platform size should be sufficient to permit use of wood cleats around the edges. Deck separators and top braces, both with cleats, should also be used, then the entire unit cross-braced with steel strapping.

### Q—Is it practical to unitize certain specific commodities and eliminate the pallet or skid?

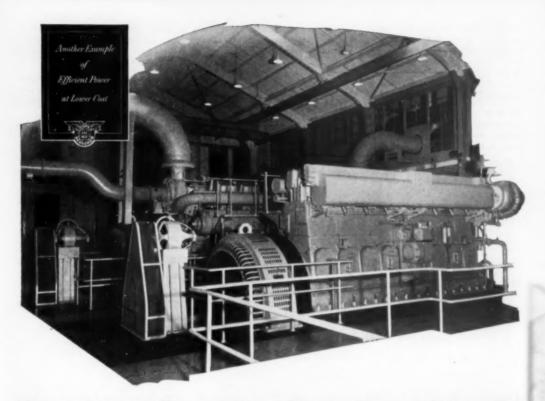
A-Yes. The products must be stacked into a unit of the desired size. If necessary, holes or voids must be provided for fork entry. The unit may also be assembled on temporary skid runners. After the unit has been securely bound with steel strapping, it may be handled by fork trucks or grab trucks. Another method is to use the product as skid runners. Aluminum, lead and zinc ingots may be stacked on two runners, of the same item. Two steel straps hold the runners to the unit and one crosswise strap confines the nnit.

### Q—What benefits are gained by strapping palletized loads for intra-plant handling?

A—Faster, safer movement between departments and a reduction of personal injury hazards, in handling and warehousing, are two major benefits to be secured.

# Q—Can knocked down fibre board containers be palletized?

- A-Yes. The unitizing of these items can be done in any of the following manners:
- (a) pallet loads secured with steel strapping, with corner protection for the load;
- (b) skid loads which are securely strapped;



# How to trade engine heat for cold cash!

If you're a technical man, you know that an engine simply converts the heat of fuel combustion into usable motion or power. You also know that there's always more or less unused heat that must be dissipated or somehow disposed of. In the installation of sizeable engines this becomes a costly problem, involving expensive cooling equipment and valuable space. Here again, recent Cooper-Bessemer developments are saving money. For example, hundreds of big Cooper-Bessemers like those shown above are used in stationary service. Because of Cooper-Bessemer developments such as the gas diesel, gas engine supercharging, and other advancements, much more combustion heat can now go to produce power, leaving

much less waste heat to be dissipated. Thus the cost of cooling equipment, piping and installation, is now greatly reduced. It's a huge plus saving over and above the gains of greater fuel economy and increased power.

Far-reaching developments like these are constantly being worked out at Cooper-Bessemer. If you have a stake in power, be sure to find out about the new things being done by one of America's oldest engine builders.

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Cooper-Bessemer

Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

(c) strapped bundles with voids for fork entry created in the bundle by including wood or fibre separators at the desired location in the bundle;

(d) bundles strapped to skid runners.

Q—How can runner collapse be prevented when wood skids are loaded crosswise in the doorway area of a railroad car?

A—Nail wood strip, equal in length to the inside clearance between skid runners, to another wood strip, equal to the outside width of skid runners. This assembly is fitted on edge, between the ends of the runners and nailed against them.

It is also recommended that auxiliary beveled runners, with properly spaced cleats, be used lengthwise in the car and under the skid runners.

Q—Are there any industries using returnable skids for shipping?

A—Yes, several, including the automotive and paper industries. One carton manufacturer has just adopted the practice, using wood top braces to effectively strap several columns of carton blanks

to the skids. Skids and top braces are accumulated at the receiving plants and returned via L.C.L. freight.

Q—Can irregularly shaped items, such as large valves, gears and journals, be protected with strapning?

A—Yes. Large valves are strapped to skid runners, eliminating much boxing or crating. Gear teeth are protected by strapping wood battens around their circumference, or strapping them to skid runners. Journals are protected in a similar manner.

# **Jackets Ease Oil Stock Handling**

Gulf Coast and South Atlantic tankers are mineral wool insulated to keep stock warm in transit, and avoid reheating for unloading at destination.

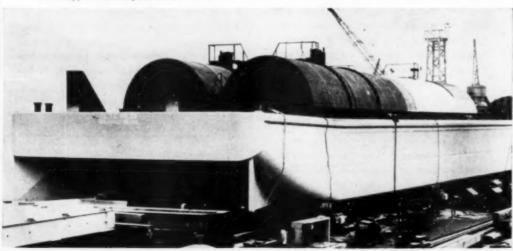
LUBRICATING oil blending stocks are very difficult to unload when at low temperatures and high viscosity. To speed unloading of oil stocks after a long trip in a tank barge, the oil tempera-

ture, usually above 110F at the starting point, must not be allowed to drop excessively en route. The six cylindrical tanks on a river barge are covered with 1½-in-thick mineral wool board insula-

tion to insure a temperature drop of no more than 20F for a six-day trip at 32F outside temperature.

The oil temperature at destination was as low as 65F with the barge equipment previously used, and it was almost always necessary to use steam to raise the oil temperature and lower viscosity. Specification of a 1½-in. thickness of mineral wool board insulation on the new tanks is based on a number

Oil tanks are shown here partially insulated. The white surface on one of the tanks shows the vinyl plastic coating before application of asphalt mastic.

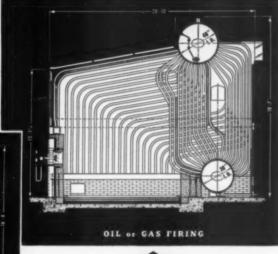


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of factors: (1) loading temperature, (2) unloading temperature (90F as an approximate minimum), and (3) trip length and the outside temperature over the route the barge travels. As an added precaution against excessive temperature drops, the barge is also equipped with steam coils.

The 240-ft-long welded steel barge was designed by naval architects of the Dravo Corporation in cooperation with the Lake Tankers Corp. and was built at Dravo's Neville Island (Pittsburgh) Shipyard. Four tanks, 39.5-ft long and 16-ft in diameter, each have a capacity of 1400 barrels. The two larger tanks, 45.5-ft long and the same diameter, will carry 1600 barrels each.

#### Insulation

To secure insulation on the curved tank surfaces, 2-in.-long straight pins were welded to the tank on 18-in. centers. Then, 24x 48-in. mineral wool boards, 1½-in. thick, were impaled on the pins. To reduce and break up gaps between sections of insulation, the boards were tightly butted together and arranged in staggered rows.

Speed nuts were applied over enough pins to secure the sections of insulation temporarily. Black enameled bands were spaced around each tank on 18-in. centers between rows of pins and tightened with a banding tool. Expanded metal lath was laid over the insulating blocks and secured by speed nuts over all pins. On the flat surfaces of the tank, application was identical to that on curved surfaces except that the insulation was not banded. Metal lath was laid over the insulation and speed nuts installed.

All surfaces were then finished with (1) a thick vinyl plastic coating over the metal lath and (2) two coats of asphalt mastic. A cotton membrane was laid into the first mastic coat of two gallons per hundred square feet. A finish coat of mastic, four gallons per hundred square feet, was applied over the membrane to complete the insulation.

Temperature measurements made by the Lake Tankers Corporation indicate the effectiveness of the insulation in keeping the oil warm from starting point to destination.

# Opening and Closing Temperatures—Lubricating Oil Blending Stocks

Lake Tankers Barge No. 39 — 15 Days Enroute (Shipment mode in December—15F min. Outdoor Tomp.)

Compartment	Lubricating Oil Stack	Closing Temperature— deg. F (Cabin Creek, West Va.)	Opening Temperaturedeg. F (Good Hope, La.)
1	Bright	128	104
2	Bright	. 128	104
3	Empty	_	_
4	Empy	_	_
5	Bright	130	106
6	Bright	126	106
7	Neutral	98	82
8	Neutral	106	82

The temperatures given in the table represent a longer trip and lower outside temperatures than are encountered in the more frequent trips from Houston to New Orleans. The outside temperature was as low as 15F during the loading period at Cabin Creek, West Virginia, and the 15-day trip to Good Hope, Louisiana, began on December 30, 1949. The table shows the maximum temperature drop on this trip, with six compartments full, was 24F.

At more normal outdoor temperatures and shorter trips, the temperature drop from loading point to destination is negligible. For example, on a trip from Houston to New Orleans—4 days at approximately 75F outdoors—Bright Stock was loaded at 95F and lost one degree in transit. Neutral Stock on the same trip was discharged at 86F—a three-degree drop from the loading temperature.

Courtesy of the Industrial Mineral Wool Institute.

# LP-Gas Systems From A. O. Smith—Houston

THE 100,000th LP-Gas system manufactured by A. O. Smith Corporation's Houston, Texas, Works was shipped recently to Butane Supplies, Inc., of Tyler, Texas.

Present at the loading of the 100,000th unit at Houston, Texas were in the usual order, C. R. Rigby, group executive; L. F. Megow, vessel division manager; F. P. Zerbe, chief engineer; and E. A. Wartgow, LPG division manager of A. O. Smith's Houston Warker.





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# **Prescription Lubrication**

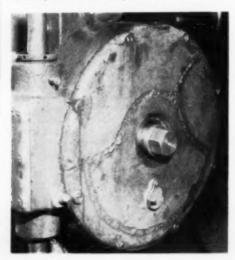
This Part XIX—"Prescribed Lubrication Practice"—is the concluding discussion in SP&I's extensive series of articles on industrial plant lubrication.

By C. J. COPLEY and WILL RISK

Lower production costs and reduced maintenance expenses are related to the thin films of oil or grease used to separate the moving surfaces of industrial machinery. Once faulty lubrication brings a key production unit to a halt, this fact is dramatized by the spiraling-costs-of-delays-in-production and the scurry and hustle to get it back on the line.

Unfortunately, lubrication is taken for granted in many plants. There is, of course, no constant rash of failures on vital machines to emphásize its important and constant role in most plants. Like the weather, lubrication is talked about, but not very much is done to get the most out of it.

Here is one of the many little things which can be most effectively handled when lubrication is organized. This is the end of a gear case on a machine tool. After welding, warpage took place. To prevent oil leakage or the necessity of purchasing a new cover, a special grease was recommended. Oil leakage was formerly % gallon per week. With special grease, gear lubricant is changed once a year with no other additions necessary. Maintenance expense was materially reduced.



Be that as it may, there are two extreme ways of looking at industrial lubrication practice. There is the PATENT MEDICINE approach. Then there is the OIL-IS-OIL approach.

The PATENT MEDICINE way is the magic-in-abarrel-of-oil method. It usually starts with the purchase of a lubricant to solve a so-called oil problem on a machine. Success attends. Belief in its curative powers over other lubrication problems begins to grow. This belief begets a following with personnel in the plant. Its use to other applications is spread, yet no practical study of its eventual good or bad effect on plant machinery is ever made. Faith in the one product—the remedy—may be so strong that new developments in lubrication manufacture are ignored. Then, unseen harm in the form of machine wear, which accompanies the extended use of one lubricant to a variety of uses for which it is not intended, is allowed to develop.

The other extreme way of lubrication practice is the over-simplified form of specification buying—the OIL-IS-OIL approach. It is characterized by the belief that any lubricant, as long as it will keep the wheels turning is satisfactory. As with the PATENT MEDICINE method, plants holding to the OIL-IS-OIL point of view seldom take any steps to justify the use of lubricants on the basis of results in terms of machine performance.

Fortunately, neither of these extreme ways of looking at lubrication practice dominate the lubrication picture in industry today. However, they do illustrate the fact that lubrication is all too often left to shift for itself, its profit-making possibilities never being fully realized.

Therefore, in these times when the pattern of industry is constantly changing, with new machines, new processes, improved methods of manufacturing, and greater needs for wringing more production out of the use of men, materials and machines, lubrication in every industrial establishment should be subjected to a periodic appraisal. Nothing, let



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alone lubrication, should be taken for granted. Plans and methods for achieving maximum benefits through improved lubrication should be attempted.

The foundation of any plan for better lubrication, of course, must be built around the principle that the right lubricant must be used in the right way in the right place. This fundamental principle holds for machines in mines, quarries or factories. At the same time, the plan should be intended for each bearing, cylinder and gear on every machine. Furthermore, it must take into account the influence of the "human element" in the lubrication of machines.

Regardless of the way in which a program for improved lubrication is developed, no plan is worth its salt if plant management will not decide to support and foster it. It is their responsibility to see that the objectives of the overall lubrication plan are determined, procedures for realizing a correctly lubricated plant decided, and the authority or responsibility for doing the job established.

Considering the complicated and specialized nature of selecting and applying lubricants, cooperation between plant personnel and the lubrication supplier is a must. Plant personnel, who know the plant's machines and processes like no one else, and the oil supplier, who knows lubricants and lubrication methods best, can then form a strong team. Once their common knowledge is pooled together, there is sure to be a healthy climate for getting the most out of the plant machines.

So, just as the needs of each individual machine part can best be lubricated by an intelligently prescribed lubricant, there can be developed an overall prescription for the better handling of lubrication in the average plant. This prescription is compounded of time and effort but it will pay off in better results over the run of time. Along the lines of doctoring prescribed by the Chinese, wherein the doctor is paid while people are well to keep them from getting sick, the work of organizing and carrying out a sound plan for better industrial lubrication today will keep machines from developing lubrication ills tomorrow.

It is the purpose of this article to prescribe a plan for organizing industrial lubrication in any plant. It contains these **five** basic ingredients,

1. Get the Facts—Have a complete lubrication analysis made by a lubricants supplier that markets a full line of lubricants and employs competent technical personnel. In making this lubrication analysis, plant personnel familiar with plant machines and existing plant practices should actively participate in this work.

The purpose of the lubrication analysis is much more important than the simple process of seeing what kind and how much oil and grease are used together with the preparation of a chart of recommendations for use in purchasing and applying lubricants selected. It should include an analysis of production losses, maintenance losses and/or benefits, improvements and profits to result if lubrication is completely organized in the plant.



Success of any program to organize lubrication depends on the accumulation of benefits throughout the plant. Here is a washing machine in a brewery. Bearing life was poor, primarily because daily applications of grease were washed away. Use of a different grease to resist this washing cut bearing loss to one replacement in four years. In addition, the lubricant is applied only once a week. Here are two important savings on one machine.

This lubrication analysis should be prepared for management by the lubrication engineer and should specifically discuss findings on maintenance costs, lubricant costs, operating factors related to lubrication, lubrication records, application of lubricants, preventive maintenance and other pertinent facts. This plant analysis should present findings on existing conditions together with recommendations, so that management can make definite plans for taking the next step.

2. Organize for Results Based on Facts Shown by the Lubrication Analysis—It can then be decided how many and what kind of lubricants are necessary to correctly lubricate every piece of machinery. It is the purpose of a good lubrication analysis to skillfully consolidate recommendations for various machines so that only a few brands of lubricant are used throughout the plant. This makes for less confusion, simplified purchasing, reduced warehousing and fewer mistakes in lubricant application. Recommendations, in the final analysis, are a blend of the knowledge of the builder of the machine, the personal experiences of the lubrication engineer and the plant operating personnel.

A prime factor in arganizing for better lubrications results must entail the development of pracedures for oilers to follow when applying lubricants. Not only must these people be supplied with charts of recommendations to guide them, but they must also be given on-the-job-training and a planof-work which will assure correct lubrication of every plant machine part.

Because lubrication depends so much on the man with the oil can or grease gun, every effort should be made to select capable men. Why select a "flunkie" or "floor sweeper" to protect the great investment in industrial machines, when a good and properly trained oiler can become the ideal "trouble spotter" in addition to his regular oiling duties.



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What other plant man sees so many details of all machines in one day as the plant oiler? Alerted, trained and recognized, such men can pay their way many times over in spotting mechanical difficulties before such troubles grow into major repair bills.

Organized lubrication should also include arrangements for a clean and protected storage for all lubricants. Some kind of space should be found or arranged. In this way the quality of lubricants can be protected for delivery to the machines.

3. Establish Responsibility for Getting the Job Done—As much as possible, lubrication should be the responsibility of one man, not several men. His duties should be supervisory. Depending on the size of the plant or the job to be done, his duties may be full or part time only.

It should be this man's responsibility to keep in touch with maintenance, operation, and plant expansions involving additional machines or the shifting of machinery within the existing plant. Not only should he direct the oiler or oilers so that lubricants are stored, handled, and used properly, but also see that records necessary for lubrication control and preventive maintenance support be kept.

Throughout much of his work, the man charged with lubrication supervision will work with or have the benefit of the experience and counsel of the oil company's lubrication engineer. The more-or-less specific duties of this man should be guided by these nine factors: (1) see that the correct lubricant is used: (2) that the lubricants are applied in the right way at all machines; (3) that all machine parts are lubricated at proper and regular intervals; (4) that charts of recommendations are developed, kept up-to-date, and used; (5) that lubricants are stored and handled properly; (6) that lubricating devices are installed and kept in good working order: (7) that information on preventive maintenance needs are channelled to the proper source for action; (8) that consumption of lubricants records are maintained in some simple fashion; and (9) that used oil is reclaimed and reused where practical.

4. Measure the Results—This should be done on the same basis as the original lubrication analysis and by the oil company's lubrication engineer with the cooperation of plant people. As to how often it should be done, that is a fielder's choice. Certainly it should be done at frequent enough intervals to assure complete comparisons with the original lubrication analysis. At any one time, the difference in results between a summary of existing conditions and the original conditions and facts included in the first plant lubrication analysis will show the benefits realized.

For example, here are typical excerpts from a report made to a rather large metal-working plant after a prescribed lubrication program was in effect for about one year: "A \$621.00 yearly saving through the application of a rust preventive lubricant to parts produced in the Automatics Department . . . full-time operation of large ring roll which was previously down 35% of the time . . reduction of mackine failures by 67% due to installation of simple but adequate lubricating devices . . . saving of \$183.75 maintenance on one cut-off saw due to previous improper lubrication . . . reduction of repairs on large hoist amounting to \$2436.00 per year . . \$1926.00 saved through the reclamation and reuse of reclaimed oils . . . life of circulation and hydraulic oils extended approximately 100% . . . anti-friction bearing replacement reduced 12%."

Such benefits as the above highlight the progress that one plant made through better planning for lubrication results. They are benefits that will be extended into the future. In varying degrees, the benefits illustrate the type of progress that can be made in many plants—usually in the direction of reduced over-all lubrication costs, increased production, or lowered maintenance expense.

5. Plan for Future Results—To get well is one thing. To keep well is another. So it is with plant lubrication. It is not enough to develop and adopt and follow a program of more lubrication efficiency. It is also necessary that ways and means for future improvements be established.

To accomplish this a periodic review of lubrication progress is essential. This is one of the big accomplishments of periodic reports on lubrication by the oil company's lubrication engineer. It should be his responsibility in servicing his company's products to continually make recommendations which deal with the use of more suitable lubricants, the redesign of bearings for better lubrication, recommendations to extend the service life of oils, the suggestion of methods for reducing oil and grease consumption, etc.

In planning for future results it is particularly necessary that a program for the instruction and education of oilers and maintenance men dealing directly and indirectly with lubrication matters be carried out. It is through this group of people, once they are given the know-how and shown the importance of lubrication, that future results will be enlarged. A good lubrication engineer, with the aid of books, movies, slide films and lubrication clinics, can do this for you. The effect of much of this education is to make plant people more lubrication-conscious. Once they are that way, and kept that way, a continued flow of possibilities for lubrication improvements will be forthcoming.

In conclusion, there is no doubt about lubrication's importance to industry. Also, there is ample proof to indicate that industry, to a great extent, looks at this important phase of their operations with considerable disregard.

Once the prescribed Program for Industrial Lubrication just outlined is put to work, however, the vital importance and money-saving aspects of lubrication will be so effectively demonstrated that "no longer will plant lubrication be allowed to shift for itself." Lubrication and the organization of it will continue to hold the eye of watchful management.

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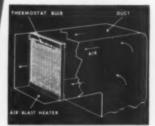
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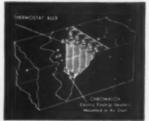
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#### **Watch That Standby Boiler**

Corrosion prevention is usually more difficult when equipment is idle than when it is in normal operation.

WHEN a boiler is in operation, oxygen in the feedwater is reduced to very low levels by means of adequate mechanical deaerating equipment. As secondary protection, sodium sulfite is generally employed for chemical removal of traces of oxygen that may remain.

But when a boiler is taken off the line to be placed in standby, the operators frequently leave the water in the unit so that it will be ready for operation again on short notice. This practice is especially dangerous from a corrosion standpoint if proper precautions are not followed. As the boiler cools, the internal pressure drops, creating a partial vacuum. All the spaces normally occupied by steam then become filled with air. The metal exposed to the moist atmosphere in these regions is extremely vulnerable to corrosive attack stimulated by oxygen and carbon dioxide.

The areas most vulnerable to such corrosion are in the steam circulating tubes, steam off-take lines, superheater headers and tubes and at or slightly below the normal water level in the drums. Even when boilers are drained and placed in "dry" standby, certain

tubes will trap water, permitting corrosion unless they are swabbed out after the unit is drained.

Under prolonged standby conditions, prevention of such corrosion requires elimination of either the moisture or the oxygen. In the first case, a boiler must be emptied, dried out and kept dry; in the latter, it must be filled completely with properly treated water and kept filled.

When the dry method is employed, great care must be taken to keep all surfaces thoroughly dry. This is especially difficult with superheaters of the non-drainable type, because condensate tends to collect in the lower bends, promoting rapid attack, even though the boiler proper remains in good condition.

The wet method gives good protection when (1) correct chemical conditions are maintained in the water with which the boilers are filled, (2) mixing of water in the boilers is satisfactory so that fairly uniform concentrations are obtained, and (3) the boilers are completely filled so that no inner surfaces are in contact with air.—Comments of Leonard Highley, Jr., and W. R. Schnarrenberger of Hall Laboratories before the N.A.C.E.

#### Maintenance of Carbide Tools

RAPID, accurate preventive maintenance inspection of carbide-tipped cutting tools is provided by a Dye Penetrant method of inspection.

Machine shops that have installed Dy-Chek inspection as a routine procedure for all carbide-tipped tools report appreciable reductions in hazards and in costly losses of time and material from failure of defective tools.

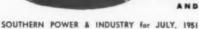
In this photo, a tool crib attendant demonstrates the simple steps required for accurate inspection of cutting tools. Three chemicals—a red dye penetrant, a dye remover and a white developer—are applied progressively to each tip. Cracks much too small to detect by the naked eye are revealed as a scarlet line on a white

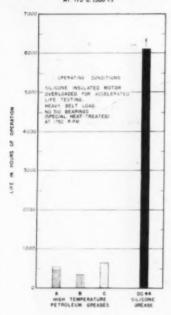
background. Defective tools are rejected and routed for repair.

Since no bulky, expensive equipment is required, the inspection method can be adapted easily to any tool storage and maintenance operation. In the photo, application is by dipping. It also can be applied by brush or spray. No royalties or license fees are required for use of the process. The chemicals are marketed by the Dy-Chek Company, a division of Northrop Aircraft, Inc.







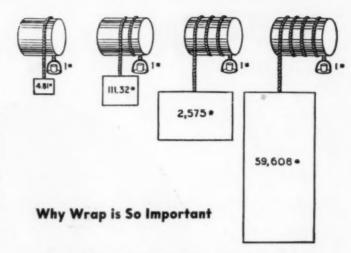


#### **Motor Bearings**

COUNT the number of conventional-type motors you have in your plant. Multiply that number by \$4.52 and you have the average yearly cost of lubricating these motors plus the cost of motor failure caused by improper lubrication. That cost is based on a carefully conducted study of motor lubrication and outage costs due to bearing failure.

With an estimated 10 to 15 million motors now in service, American industry spends 45 to 67 million dollars a year that might be saved by the use of DC 44 Silicone Grease. That possibility is based on the performance of this Dow Corning Silicone grease in about half a million cartridge ball bearings used in a widely advertised line of industrial motors. Experience has proved that these bearings, prelubricated for life with DC 44, require no further attention.

That confirms the testing done by Dow Corning, by bearing manufacturers and by the military establishment. Data such as that shown above indicate that you can expect DC 44 Silicone Grease to last at least 10 times longer than high temperature petroleum greases.



These illustrations show how rapidly the effective pull increases with increased wrap or arc of contact.

In the first sketch  $\alpha$  rope is slung around a drum embracing 180 degrees are of contact. That is, the rope goes "half around". Coefficient of friction of the rope on the drum is assumed to be 0.5 in the computations. Under such conditions a one lb weight suspended from one end of the rope will support 4.81 lb suspended from the other end of the same rope. This is due entirely to the rope's friction and to the arc of contact.

In the second sketch, the rope embraces the drum 1.5 times. The same one lb weight will now support 111.32 lb suspended from the other end of the rope.

In the third sketch the rope embraces the drum 2.5 times and the weight supported jumps over 2400 lb to 2,575 lb.

In the fourth sketch at the right, the rope is wrapped around the drum 3.5 times and the weight supported advances to the astounding figure of 59,608 lb.

Have you ever noticed a boatsman quickly grab a rope, wind it around the bitt a few times, take up the slack and then hold a huge liner without the least rope slip. The illustration shows why the boatsman's rope does not slip.

It also explains why a wrapper pulley is often so important on a belt drive. The wrapper pulley causes the belt to have more than 180 degrees of contact. At 180 degrees, if the belt has a coefficient of friction of 0.5, a pull of 100 lb on the "slack side" will create a pull of 481 lb on the tight side. If the arc of contact is increased still more, the effective pull will be correspondingly greater.

The calculations also explain why close - fitting high - friction brake bands, with ample arc of contact, hold as much and as well as they do.

Calculations are based on the following formula, which is used

in connection with drums, hoists, sheaves, etc.

$$\frac{T}{-} = e^{t_{\text{BS 1416}}}$$

The formula will be found in treatises pertaining to power transmission through belts as it includes the wrap of the belt around the pulley and emphasizes the importance of such wrap.—W. F. SCHAPHORST.

## PACIFIC PUMPS

Custom-Built Boiler Feed Pumps

in any size..

to fit your feed installation



The history and background of Pacific Boiler Feed Pumps is a history and background of the design and manufacture of centrifugal pumps for the most extreme temperatures and pressures called for by industry. Pacific designed the solid forged steel case for high pressures and high temperatures... pioneered the use of chrome alloy steels for impellers, diffusers and all other internal parts, as well as developing many other features now recognized as standard in the industry. Pacific Boiler Feed Pumps in operation include small units of the vertical type for 47,700 lbs. per hr. and 710 psig discharge pressure to very large units of the horizontal type for 800,000 lbs. per hr. and 2430 psig discharge pressure. Pacific has the solution for your boiler feed problem.

**Bulletin 109 Gives Details** 

PACIFIC
Precision, Built
PUMPS

SALES AND SERVICE IN ALL PRINCIPAL CITIES

Pacific Pumps inc.

HUNTINGTON PARK, CALIFORNIA

Export Office: Chanin Bldg., 122 E. 42nd St., New York \* Offices in All Principal Cities

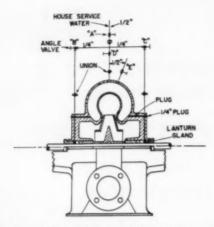
#### Two-Way Supply of Sealing Glands

WE have a centrifugal pump with sealing gland water coming from the pump casing. This method gave us no end of trouble since we were unable to change or govern the amount of water going to each lantern sealing gland.

To remedy the situation, we plugged the openings in the pump casing. We also tapped a ½-in. opening (E) in the top of the pump. This was in addition to the existing opening.

When it becomes necessary to start up the pump we open valve A from house service line; open valve D on top of pump; open valve E to let out any air; and open valves B and C.

When all the air is out of the top of the pump and water starts to run out of E, the pump is started. We then close off valve D and when valve E shows that the pump has caught the water, it is closed. Valve D is then opened and valve A closed.



The pump is then being sealed around the shaft by the pressure from the pump itself.

The amount of water leaking out along the shaft can be controlled by valves B and C. If for any reason the sealing lines become clogged with sediment and we are unable to close down the pump, valve A is opened and valve D closed. This

puts the house service water pressure direct on the sealing glands. Our house service water pressure is somewhat higher than the normal pressure developed by our centrifugal condenser pumps.

Extensive use of unions in the pipe lines facilitates cleaning.—
GEORGE G. AVANT, WILMINGTON, NORTH CAROLINA.

#### Water Wheel Cut for Salvage

AFTER Alabama Power Company replaced a 55-ton cast iron water wheel at Jordan Dam with one of greater capacity, the problem of how to cut up the old one for scrap presented itself. It was desirable that it be cut into small pieces so that it would be of maximum salvage value and so that it could be handled easily in shipping by truck.

Though it had been said that such thick cast iron could not be cut successfully by oxygen-acetylene torch, William R. Garnett, supervisor of hydro plants, thought it could be. He called K. V. Nickell of Air Reduction Sales Company, who went to Jordan Dam with James R. McFarland, also of the Air Reduction Company, to give a demonstration.

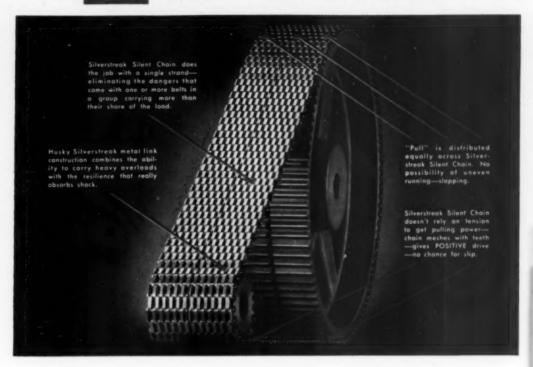
After thirty minutes demonstration, Spike Jones, Jordan Dam mechanic, took over the torch. He made a clean cut through the cast iron from three to eight inches thick. Mr. Jones is shown in the left picture cutting through the casting as if it were steel. On the right is the cut wheel.

Standard equipment was used in the cutting of this wheel by oxygenacetylene torch. The torch was a standard size of Air Reduction Sales Company. Gas used was a mixture of five standard oxygen and two acetylene cylinders. During the cutting the torch was shifted from side to side so that the iron was blown out as it was melted.





## Get full rpm transmission...



#### LINK-BELT Silverstreak Silent Chain Drives

## Slip-proof Slap-proof Shock-proof

Take the proven road to increased production—through the best in high-speed power transmission. You'll find Link-Belt Silverstreak Silent Chain Drives are 98.2% efficient. With normal maintenance, you have a positive drive that runs for years and years.

And note this important point — on extremely short centers Silverstreaks lose none of their efficiency. What's more, reduction ratios as high as 10-to-1 are frequently used. Both of these Silverstreak features save you valuable space.

One test will prove to you why thousands of production-minded engineers have standardized on Link-Belt Silverstreak Silent Chain Drives.



SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY, Atlanta, Dallas 1, New Orleans 12, St. Louis 1, Charlotte 2, N. C., Baltimore 18, Birmingham 3, Houston 1, Jacksonville 2. Distributors Throughout the South

### **NEW EQUIPMENT** for Southern Industry

Mechanical Seal

CRANE PACKING COMPANY, 1800 Cuyler Ave., Chicago 13, Ill., has developed a new mechanical seal to perform effectively under severe temperature and corrosive conditions. The seal incorporates a flexible ring molded from the new plastic, Teflon. This wedge-ring enables the seal to combine the chemically inert properties of the plastic with the flexibility and positive sealing components essential to mechanical sealing. It can be employed at temperatures up to 500 F.

The seal has been designed for service on various rotating shaft appli-

Free additional information is available to readers of Southern Power & Industry. Check item number on the postage free service coupon post card—page 17.

cations, such as centrifugal pumps, turbines, positive displacement pumps and agitators.

Bending Equipment

H-3

TAL BENDER, INC., Milwaukee 2, Wis., has added to their line of bending equipment a tool for making offsets and bends up to 180 degrees in % in., ½ in. and % in. O.D., K and L Copper Tubing, Brass, Bundy Weld, Steel, and other light gage tubing.

Made from a special strong light weight metal, this little hand tool is fast and simple to operate, and no vise or fixtures are required. As all three sizes are combined in the same tool, it is called the "3 in One" and has no loose parts.

The tool is applicable to the refrig-

eration line, for radiant heat coils, and for production and repair work where copper tubing is to be bent.



#### New Chain Drive

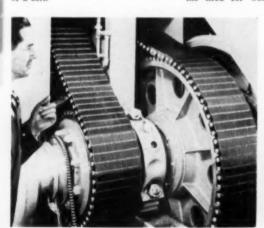
H-2

MORSE CHAIN COMPANY,
7601 Central Ave., Detroit
8, Michigan, has announced
their Hy-Vo (high velocity) Chain
Drive, providing, according to the
manufacturer, a power transmitting
medium that combines the ruggedness
and dependability of a gear drive with
the smoothness and lack of vibration
of a belt.

The drive makes possible single drive units capable of transmitting as much as 5,000 hp at linear speeds up to 6,500 fpm, or rotative speeds up to 3,600 rpm. Manufacturer states that a Hy-Vo drive only 2-in. wide has transmitted as much as 500 hp.

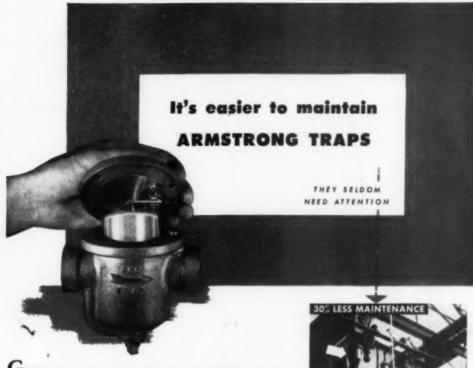
Besides increases in speeds with much narrower widths than conventional drives, Hy-Vo drives eliminate the need for wide, unwieldy units with shaft extensions, outboard bearings, mounts and other accessories presently required for high-speed engines.

The new drive is designed specifically for speed applications higher than conventional chain drives, and to replace belt drives now required for high-speed power transmission. A 6-in. Hy-Vo Drive, for example, will do the work of a 24-in. belt.



These two 2-in. pitch, 12-in. wide Hy-Vo drives transmit the power needed by this new Diesel-electric drawworks designed to drill 20,000 ft holes. The 1500 hp, 500 prp drawworks was built by the Emsco Derrick & Equipment Company. In the new Morse drive, the sprocket teeth are involute in contour. The chain and sprocket engagement principle reduces shock loading and highly aggravated stresses in the chain links, as well as noise, vibration and heating. Pitch elongation or "stretch" has been eliminated to the extent where it is virtually unnecessary to provide any means of take-up.





GOOD preventive maintenance of course calls for periodic steam trap inspection. To look inside an Armstrong trap you simply remove the cap and lift out the entire mechanism, which is connected to it. The body full of boiling water remains in the line and need not be handled.

Only rarely does inspection reveal the need for cleaning or repairing an Armstrong trap. The swirling action of the condensate during discharge continuously scrubs the trap clean. The hardened chrome steel valve and seat stay steam-tight for a long, long time without attention. There is no wire drawing. The leverage system is almost completely friction-free, will operate hundreds of thousands of times without wearing out.

For trouble-free trap performance there is nothing to compare with an Armstrong. Your local Armstrong representative can help you select the right size traps for your requirements. Call him.

> ARMSTRONG MACHINE WORKS 806 Maple Street . Three Rivers, Michigan

THE ARMSTRONG SERVICE GUIDE explains trap maintenance and repair, contains useful trouble sbooting tips. Send for your free copy.





Armstrong traps on law pressure heating systems require far less maintenonce then previous traps...John Deere Harvester Works, East Moline, Illinois.



"4 to 5 years service without replacement parts is average on traps draining driers. Same traps in service with no parts for 7 or 8 years—and one for 15 years!"-Waymouth Art Leather Co., South Braintree, Massachusetts.

ONG ST

Dependable Yarway Blow-Off Valves

STOP a lot of

boiler blow-down troubles...

... and keep production
schedules on the GO
by avoiding costly
power shutdowns

Famous Tarway Sociless Tandem blow-off valve, with balanced sliding plunger design. Type "B" ishown) is for pressures to 400 pci. Available in all combinations of angle and straightway valves. More than 18,000 bottler plants of all pressures use Yarway blow-off valves. Write for Bulletin B-434.

YARWAY BLOW-OFF

YARNALL-WARING COMPANY

Home Office: 116 Mermaid Ave., Philodelphia 18, Pa.

Southern Representative

TOGER A. MARTEN, Bong Allen Building, Allente 3,

#### new equipment (continued)

For more data circle item code numbe on the postage free post card — p. 17

#### Pressure Washer

D. & M. PRODUCTS, INC., 30 N. Raymond Ave., Pasadena 1, Calif., has announced an improved air and water pressure washer. The device connects directly



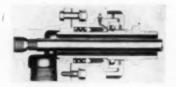
to ordinary air and hot or cold water supply outlets and is capable of delivering either a "cold steam" or a fine spray that penetrates the smallest cavities. The compressed air separates the water into minute particles, thus breaking the surface tension or the water and producing a fine penetrating spray. The manufacturer recommends it for all types of industrial cleaning as a rinsing device after detergents and other pre-soaking chemicals have been applied. The washer is shaped like a revolver and fits into the palm of the hand. It is chromeplated.

#### Revolving Joint

H-6

BARCO MANUFACTURING Co.,
Dept. J-43, 1801 Winnemac
Ave., Chicago 40, Ill., has
introduced a new type of revolving
joint for use in making piping connections to drum type dryers, rolls,
and other rotating equipment. The
new joint has extremely low torque,
thus offering substantial power savings. Models are available for handling steam, oil, air, water, gas, and
chemicals.

The rotating portion of the joint consists of a special precision machined and heat treated steel tube which screws into the hub of the drum or roll. The non-rotating por-



tion of the joint is ball bearing mounted on this tube. The ball bearings carry the load of both radial and end thrust. A sleeve type pilot bearing is used at the end of the rotating tube to insure alignment of the joint and provide a long bearing against twisting or cocking.

The joints are built for 150 psi, steam, or 200 psi, hydraulic, and also for vacuum service. They are recommended for speeds up to 500 rpm, steam, or 750 rpm, hydraulic, and temperatures up to 450 F, depending on packing specified. Standard sizes range from \(\frac{1}{2}\)-in. to 2-in. Body types include both single and syphon or two-way flow models with straight and angle connections.

#### Diesel Fork Lift Truck

THE YALE & TOWNE MANUPACTURING COMPANY, Philadelphia Division, 11000
Roosevelt Blvd., Philadelphia 15, Pa.,
has announced a new industrial fork
lift truck, powered by a diesel engine,
and equipped with a hydraulic transmission. The new model is specifically
designed for applications where fire
hazards exist, where there is a limited
amount of fresh air, and in outdoor
areas where continuous heavy-duty
operation is necessary.



The truck utilizes a Hercules six cylinder diesel engine with a continuous rating of 70 hp. It is equipped with Bosh governor controls. All power impulses from the engine are transmitted through a double impeller fluid coupling. This fluid coupling, because of its hydraulic balance, is said to eliminate chattering and stalling, and assure full engine power for heavy pulling.

The power plant of the new truck features large hypoid gearing of the type usually found in highway carriers.

#### Steam Gun

H-5
123A Thames St., New York
6, N. Y., has announced a
new steam gun for use in heavy-duty
steam cleaning operations. The gun
is designed for use where range of
operation pressure (psi at boiler end
of hose while gun is in use) is 50 to
100 psi, with minimum boiler rating
of 25 hp or more recommended. With
this gun the steam-detergent spray is
automatically lifted 12 ft above the

working level to provide thorough cleaning of large equipment and other surfaces.

The gun, 7½ ft long and weighing 15% lb, is equipped with 2 cast aluminum spade-type insulated handles. Forward handle remains stationary, while rear handle turns and rotates entire gun. A swivel coupling for the steam hose connection prevents twisting of hose and simplifies handling. Gun is equipped with seamless steel nozzle, and special flat nozzle is available.



# STEAM GENERATING UNITS designed to meet the <u>needs</u> of INDUSTRY

NEW SPRINGFIELD UNIT FOR
PULP AND PAPER MILL

SPRINGFIELD is building steam generating units for virtually every branch of industry: for PAPER MILLS... for TRACTOR PLANTS... for MILLS... for TRACTOR PLANTS... for AUTOMOTIVE PLANTS... GLASS FACTORIES... special boilers for CHEMICAL MANUFACTURERS. Shown at the right is a modern 80,000 lb. combination wood and oil fired Springfield unit installed in the power house at the pulp and paper mill of Publishers Paper Co., Oregon City, Oregon.

Springfield specializes in the fabrication and erection of steam generating units designed to meet the user's particular requirements: ANY SIZE...ANY PRESSURE... ANY TEMPERATURE AND FOR ANY FUEL. Springfield is organized to apply the same engineering skill to all contracts, large or small. We will be glad to submit a proposal covering your requirements.

Check with Your Consulting Engineer on Modernization and New Plant Projects

Location: Publishers Paper Co., Oregon City, Ore. Consulting Engineer: H. W. Beecher, Seattle, Wash.

This unit is designed for 250 psig and operates at 200 psig with 500°F, total steam temperature at superheater outlet. In addition to superheater, it is equipped with a Springfield fubular air heater and a completely water cooled furnace, including a specially designed water cooled grate for burning wood in such a manner that the hearth tubes serve as water walls when burning oil only.

The unit is designed to deliver 80,000 lbs. per hour continuously and 110,000 lbs. per hour for two-hour peak when fired with all only. When fired by wood and oil, it will develop 25,000 lbs. per hour on wood and 55,000 lbs. on all firing.

SPRINGFIELD BOILER CO.

1957 E. Capitol Ave., Springfield, Illinois, U.S.A.

Worldwide Sales and Service

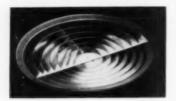
BENT TUBE BOILERS - STRAIGHT TUBE BOILERS - SUPERHEATERS - DESUPERHEATERS - AIR HEATERS ECONOMIZERS - WATERWALLS - PACKAGE BOILERS - COMPLETE STEAM GENERATING UNITS

See Our Catalog
in SWEET'S

#### new equipment (continued)

Air Diffusers

H-8
ANEMOSTAT CORPORATION OF
AMERICA, 10 East 39th St.,
New York, N. Y., has recently announced a new line of highpressure, aspirating air diffusers. The



units are available in three sizes: with a neck area of 32.81 sq in., rated 80 to 170 cfm primary air capacity at .5 to 2.35 wg static pressure; with neck area 42.75 sq in., rated 105 to 222 cfm at .68 to 3.1 wg; and with a neck area of 60 sq in., rated 145 to 312 cfm at .7 to 3.2 wg.

The new units can be used on air distribution systems which carry air at velocities up to 5000 fpm and static pressures up to 6 in. wg. High temperature differentials (up to 30 F) can be handled. Air volume can be manually or automatically controlled.

#### Fork Truck

MARKET FORGE COMPANY, Everett, Mass., had added a new fork truck to its line of rider-driven, self-propelled materials handling units. The new truck was



For more data circle item code number on the postage free post card — p. 17

especially developed to meet the needs of small and medium-sized plants.

The equipment is light in weight and small in overall dimensions. Weighty parts are placed in positions to obtain maximum counterbalance with loads. Overall length of the truck is 55½ in., exclusive of the forks. Width is 31 in. These dimensions permit the truck to traverse narrow aisles easily, to get in and around congested areas, and to fit into small elevators.

#### Chain Conveyor

H-10
SOUTHERN ENGINEERING
Co., INC., 249 N. First St.,
Burbank, Calif., has developed a new light capacity, power
driven, overhead chain conveyor.



The conveyor will handle loads up to 30 lb on each pendant spaced at 6-in. intervals or 60 lb loads can be carried at 12-in. intervals when supported by two pendants fitted with crossbar attachment.

The heavy duty drive uses a special sprocket type drive to distribute chain stresses and afford a straight line pull and permit operation in either direction. Mounting is made at any 90 degree corner of the conveyor line.

Instant adjustment of speeds of from 3 to 9 fpm while the conveyor is in operation is made possible by the varispeed drive which is on all standard power units. Higher or lower speed ranges are available on special order at no additional cost.

#### **Trolley Hoist**

H-II WRIGHT HOIST DIVISION, AMERICAN CHAIN & CABLE CO., INC., York, Pa., has added an army type trolley hoist to its line. The new hoist is made in capacities from ½ ton to 3 tons and is available with special load bar and either a pair of two-wheel plain trolleys or one plain and one geared two-wheel trolley.

The plain trolley assembly has chilled tread wheels equipped with New Departure ball bearings, steel side plate and connections to load bar. It is adjustable for a wide range of beam sizes.



The geared trolley is constructed the same as the plain trolley type except that the wheels are furnished with gear rings having cut teeth, pinions with cut teeth handwheel, hand chain and hand chain guide. Thrust rollers are mounted to insure proper alignment.

#### Fork Lift Trucks

H-12

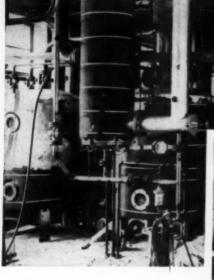
THE YALE & TOWNE MFG.
Co., Philadelphia Division,
11000 Roosevelt Blvd., Philadelphia 15, Pa., has announced a completely redesigned line of light capacity electric fork lift trucks available in capacities up to 2,000 lb. The new trucks feature automotive-type controls, hydraulic lift, and compact size.

New magnetic contactor control prevents careless drivers from imposing unnecessarily severe loads on the motor. There is a time delay between speeds for smooth, uniform acceleration. Special non-plugging device on the electric controller prevents reversal of power in any but first speeds.

Other design features of the new truck include hypoid gearing for added strength in power transmission, inclined king pins to take the rough work out of steering, and hydraulic brakes for smooth stops. No braking takes place through the gear train.







This typical equipment, used in processing where temperatures range from 0°F. to 200°F., is insulated with curved seg-ments of PC Foomglas.



#### **Improve Plant Performance** ... REDUCE INSULATING COSTS

When you improve temperature control you can run your plant more efficiently. With PC Foamglas you can control temperatures more exactly, more economically.

HERE'S WHY: Since it consists of still air sealed in minute glass cells, Foamglas is an excellent barrier to heat transfer. Glass has unusually high resistance to many elements that cause insulation to deteriorate. Consequently, long lasting, trouble-free service makes Foamglas the least expensive insulating material.

PC Foamglas is available in standard flat blocks, curved segments and beveled lags, to fit equipment sides, heads and domes, and in preformed sections for standard size pipe and fittings.

We invite you to send in the coupon for a sample of PC Foamglas, and for free literature containing complete information.

> PITTSBURGH CORNING CORPORATION Pittsburgh 22, Pa.



## FOAMGLAS®

The cellular glass insulation

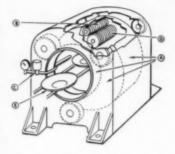


Pittsburgh Corning Corporation Dept. AE-71, 307 Fourth Avenue, Pittsburgh 22, Pa.
Please send me without obligation a sample of Foamglas and your FREE booklet on the use of PC Foamglas for Industrial Insulation.
Ngme
Address
CityState

WHEN YOU INSULATE WITH FOAMGLAS... THE INSULATION LASTS!

#### Industrial Coating

THE GYROMAT CORPORA-H-17 TION, P. O. Box 600, Fairfield, Conn., is producing industrial coating equipment known as the Gyromat. The new unit is said to provide a full coverage coating of from .0008 to .025-in, thickness of any coating material in one passage, at high speed.



As shown in the illustration, coating material is fed from external source through feedline C to the annulus of rotating bowl A. Rotation of bowl carries material to feeding rotor B which is driven by the fluid friction of the coating material.

Rotor B throws the material centrifugally into the surface of high speed rotor D, which atomizes the material into fine mist and floats it onto the work passing through the bowl on conveyor E.

The excess material (overspray) is caught by the bowl and returned to the annulus in its former fluid condition.

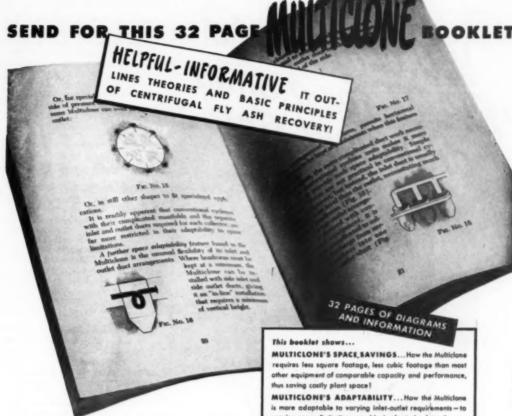
Applications of the equipment include coating for electrical relays, electronic parts, bulky metal products, plastic items, and other industrial use.

#### Power-Factor Meter

GENERAL ELECTRIC COM-PANY, Schenectady 5, N. Y., has announced a new hookon power-factor meter, which permits direct measurement of power factor without cutting conductors or interrupting electrical service.

The new testing instrument may be used on any balanced 3-phase circuit. It gives direct power-factor readings in circuits with voltages ranging from 100 to 600 volts and currents from 15 to 600 amperes.

The device is a companion to the company's hook-on volt-ammeter and hook-on wattmeter. It is designed for use in industrial plants where maintenance of high power factor is an important economic consideration. Small, light, and portable, the meter



No MATTER whether you are now using mechanical dust recovery equipment or are planning the installation of such equipment at some future date, here is a booklet that is full of helpful and valuable information on centrifugal dust recovery. It not only explains the basic methods and principles involved, but also shows the important differences between small and large diameter separating tubes, shows how to simplify your duct work and reduce installation costs, and outlines many other important factors to be considered in selecting mechanical dust recovery equipment.

In addition, this informative booklet illustrates and explains how MULTICLONE'S unique vane design is fundamentally different ... how it makes possible greater compactness, simpler installation, high recovery of the small particles as well as the medium and coarser ones, and many other facts on MULTICLONE advanced design.

A limited supply of these booklets is available for free distribution to those interested in mechanical recovery equipment and methods. Write for your copy today.

NOW SELLING ...



in all parts of the U.S.A. and foreign countries.

varying space limitations — and is simpler to insulate, thus reducing installation costs !

MULTICLONE'S EFFICIENCY... How Multiclone's multiple small diameter tubes, made possible by its exclusive vane design, give higher centrifugal forces and more complete cleansing of all suspended particles—even small ones of 10 microns and less!

MULTICLONE'S LOW MAINTENANCE ... How the Multiclone has no high speed moving parts to repair or replace, no pads or filters to clean or renew, nothing to choke gas flow or increase draft losses as suspended materials are recovered. Multiclone draft losses remain uniformly low-recovery efficiencies uniformly high—at all times!

Make sure that a copy of this helpful booklet is in your reference files by sending for your copy new!



TONE TOST WEST MINTH STREET, LOS ANGELES IS, CALIFORNIA CHRYSLER BLDG., NEW YORK 17 . 1 LoSALLE ST. BLDG., 1 M. Lo SALLE ST., CHICAGO 2 . HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA PRECENTATION CO. OF CANADA LTD. DIGMINION SO, BLDG. MONTREAL





This True Ball Joint Makes the Difference

Why? The answer is easy! It's because Darts are made with greater care.

Take the joint, for instance! Both seats are made of resistant bronze; both are swaged into place under great pressure — permanently interlocked with the ends. And both are precision machined, then carefully spherically ground to give very wide, near perfect contact.

Finally — to protect the seats, give extra strength — ends and nut are made of practically indestructible, air-refined, high test malleable iron.

Little wonder Darts are drop-tight without excessive wrenching. No wonder you can use them again and again.

#### DART UNION COMPANY

Providence 5, Rhode Island
The Fairbanks Co. — Distributors
Boston New York Pittsburgh



can be used to locate those circuits where corrective action is needed.

To operate the instrument, the user clips the voltage leads to the potential source, clamps the hook around the conductor, and rotates the selector dial to obtain the proper power-factor reading. No complex connections or control settings are required.

The meter is said to give readings accurate to within 0.05 power factor. It has a frequency range of 50 to 90 cycles, an effective scale length of 13.5 inches.

#### Electric Circulation Heaters

H-19
EDWIN L. WIEGAND Co., 7500
Thomas Blvd., Pittsburgh 8,
Pa., has developed large
Chromalox electric circulation heaters,
fully insulated and with automatic
temperature control. The 40 kw size is
designed for preheating regular
fuel oil to approximately 170 F to
increase efficiency of combustion. Such
cil-fired installations are applicable to
heating ovens, kilns, annealing furnaces, and central heating systems
for factories.

Similar electric circulation heaters can be used for preheating Bunker C oils to make them flow freely from storage reservoirs.

According to the manufacturer, these same "packaged electric heaters" are quickly connected for economical heating of large quantities of water. For this use, the same style heaters are rated 50, 75, and 100 kw.

#### Vacuum Lifters

H-20
INDUSTRIAL PRODUCTS COM-PANY, 2892 N. Fourth St., Philadelphia 33, Pa., has announced an improved line of vacuum lifters for punch press feeding and



other production uses. The lifters are designed to prevent finger and hand injuries and to speed up the work. The manufacturer recommends them for both high and low stroke punch presses, lifting, feeding and positioning blanks. The lifters may be used on all non-porous, rigid materials — metal, glass, fiber, plastic, or tile, flat or curved surface.



MULTIPORT



MULTIPORT RELIEF VALVE



MULTIPORT



MULTIPORT



MULTIPORT WATER FOOT VALVE



MULTIPORT AIR & GAS CHECK VALVE

#### THE SAFE, TIGHT, QUIET MULTIPORT RELIEF

#### What Owners say about Cochrane MULTIPORT VALVES

"Twenty-five years of service. No other comment.

"Opened for inspection only once in 17 years."

"Opening and closing every 30 seconds with but little interruption for more than 12 years."

'This valve in service about 20 years with no maintenance."

"Savings cannot be computed. Absence of trouble is worth the price."

"No maintenance except change of springs for different pressure range after almost 15 years.

"No breakdown, notrouble, no expense."

#### PRESSURE PLATE BY WHICH PRE-DETERMINED VALVE PRESSURE S ADJUSTED INDIVIDUAL LIFTING SPINDLES AND COMPRES-SION SPRINGS ADJUSTING HAND WHEEL CAN ALSO BE OPERATED BY CHAIN, MOTOR OR REMOTE CONTROL MULTIPLE VALVE DISCS INSTEAD OF SINGLE DISC INSURE AGAINST FAILURES, RE-DUCE IMPACT MULTIPLY FLOW

#### Over 15,000 Cochrane Multiport Valves in Service NOT ONE KNOWN FAILURE

COCHRANE CORPORATION 3110 N. 17th Street PHILADELPHIA 32

In Canada: Canadian General Electric Co., Ltd., Toronto; In Mexico: Babcock & Wilcox de Mexico, S.A., Mexico City: In Europe: Recuperation Thermique & Epuration, Paris.



Cochrane Corporation 3110 N. 17th Street, Philadelphia 32, Pa. Please send me a copy of Cochrane Publication 4150 on Cochrane Multiport Valve.

Address .. Zone

COCHRAI





State

### EVERLASTING VALVES

Mean"Everlasting"Protection on these duties



GENERAL SERVICE

Wherever frequent use and quisk operation is required for any liquid or gas at pressures up to 300 psi. Those valves have out-



STEAM JACKETED



FIRE PROTECTION

Closing type for inflammable liquid emergency shut-off, or opening type for deluge or firalinnge, assuring immediate and poslive action with weighted pendulum step.



BOILER BLOW-DEE

wheel operated. Angle and "Y" types and combination units meeting ASME Code requirements for pressures up to 600 psi.



BOILER WATER COLUMN
With indicator and locking device
Means ASME Code requirements.

#### EVERLASTING FEATURES

For more than 40 years, EVERLASTING VALVES have been known for their ingenious design, simple sturdy construction, and long trouble-free life with low maintenance expense. Some of their distinctive features are:

Quick-Action . . . opened or closed with less than a quarter turn of the operating lever.

Straight-Through Flow . . . the disc cannot become loose and accidentally check the flow.

Drop-Tight Seal . . . constant contact of disc and seat at all times prevents dirt or scale from getting between.

Self Regrinding . . . the disc rotates on the seat with each operation, thus regrinding the sealing surfaces.

No Wedge Action . . . all parts move between parallel faces.

Write for bulletin describing EVERLASTING VALVES in detail.

EVERLASTING VALVE COMPANY 49 Fisk Street, Jersey City 5, N. J.

## Everlasting Valves

for everlasting protection

For more data sircle item code number on the postage free post card - p. 17

#### Tractor-Shovel

H-21 THE FRANK G. HOUGH Co., 878 Seventh St., Libertyville, Ill., announces a new tractor-shovel unit known as the Payloader. The new unit has a ½ cu yd



bucket, front wheel drive, and a fullreversing transmission giving four forward and four corresponding but faster reverse speeds. Top speed forward is 14 mph, and top reverse speed for carrying full loads is 23 mph.

The heavy duty engine is mounted at the rear to provide maximum capacity and stability. The lifting and lowering, and the dumping and closing of the bucket are accomplished by hydraulic rams by fingertip control of the operator. Maximum dumping clearance is 7½ ft but loads can be dumped at any point of the lift.

#### Overhead Conveyor Curve

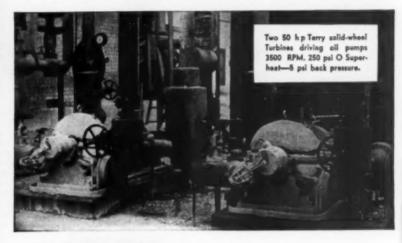
H-22

E. W. BUSCHMAN COMPANY, Dept. 44-B, Cincinnati 32, Ohio, has announced a sharp vertical overhead
conveyor curve known as the "Quick
Dip." The assembly was developed
for use in dip painting of conveyorcarried production, with overhead
trolley wheel type conveyor.

The equipment is factory fabricated for field assembly without welding. The radius of the curve is 9½ inches; the included angle is 60 degrees.



## LIE RIRY



## LARGE BLADE CLEARANCES GIVE ADDED DEPENDABILITY

Terry Turbine blades have the protection of generous radial and axial clearances. Axial clearance is so large — a full inch — that end play can do no demage.

Projecting rims at both sides of the wheel give further protection to the rotor buckets. Should clearance become reduced, these rims will take rubbing without damage to the blades.

This construction also makes frequent inspection of thrust bearings unnecessary.

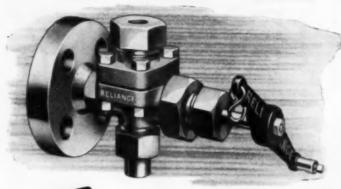
If you have a specific turbine drive job in mind, our district Terry representative will be glad to discuss it with you. A request on your business letterhead will bring you Terry Bulletin S-116 giving detailed information about these features and other Terry Turbine advantages.

T-1174



THE TERRY STEAM TURBINE COMPANY TERRY SQUARE, HARTFORD, CONN.





## Exciting News!

#### Reliance removable packing box water gage valve latest development for safer, better gage maintenance

 This new-type valve reduces time spent near the drum—lets you take inserts and nipple packing boxes down for bench convenience servicing.

A better packing job prevents steam-cutting of nipples on expensive high pressure inserts. Assure longer insert life by always using completely new packing and gaskets. With these valves they can be properly installed where work can be done in comfort.

A heavy-duty valve of forged steel in typical Reliance rugged construction, available in flanged or screw connection. Good for pressures up to 900 psi. Profitable to use for power boiler service

or oil, ammonia, Dowtherm, acids. Highly praised by engineers who have installed them. Write for catalog page B2.3.

THE RELIANCE GAUGE COLUMN COMPANY 5902 CARNEGIE AVE., CLEVELAND 3, OHIO



Reliance makes a complete line of Water Columns, Water Gages and other \*-im for all working steam pressures.

Reliance



#### Fork Truck

H-23

CLARK EQUIPMENT COM-PANY, Industrial Truck Division, Battle Creek, Mich., has added a pneumatic-tired 15,000 lb fork truck to its outdoor line.



The manufacturer recommends it for use in big-load handling operations including lumber mill yards, steel mill storage yards, steel warehouses and fabrication plants, and other applications requiring fast handling of extralarge, heavy loads.

The truck has a 22-in. diameter hand wheel which operates a hydraulic power steering-control. In case of engine stoppage, the steering linkage can be operated mechanically. An extra-wide axle provides maximum stability of load. Frame is of heavy construction.

#### Clamp Attachment

H-24

THE POWER TOOL DIVISION,
ROCKWELL MANUFACTURING
Co., 600 East Vienna Ave.,
Milwaukee 1, Wis., has announced the
availability of a clamp attachment



for the standard Delta miter gage. This device consists of a bracket and two clamps which hold the work firmly in position. The miter gage and clamp attachment can be used on 8 in. and 10 in. Delta circular saws, band saws, spindle shaper, and abrasive finishing machines.

#### Portable Work Table

H-25

MARKET FORGE COMPANY,
Everett, Mass., is producing
a new table truck for use
by manufacturers of fine tools, dies,
and precision instruments. The metal
frame work is are welded throughout,
and will support up to a ton of weight.

The top is of 2-in selected hard maple, jointed true and glued, has natural wood finish, and is reinforced with concealed bolts.

The unit measures 48-in. long, 30-in. wide and 31-in. high with casters (6-in. dia semi-steel swivel type). The table is also available with legs and can be furnished with floor locks.

#### Regulating Equipment

H-26

ALLIS-CHALMERS MANUFACTURING Co., Box 512, Milwaukee, Wis., has developed a voltage measuring and control panel in connection with the company's rotating amplifier-type generator voltage regulator. The panel has no moving parts or electron tubes.

This static regulating equipment is built in standardized panel sections which can be mounted either in a convenient cubicle or in switchgear units. It consists of a compensating unit for reactive current division, stabilizer panel, static voltage measuring circuit, a battery excitation switch and resistor, and a damping transformer assembly mounted from top to bottom in the cubicle.

A knob on the front of the reactive compensating units adjusts the autotransformer, while reactors and other units are mounted on the rear of the panel.

The stabilizer panel consists of transformers giving rate of change signal, capacitors and resistors. It operates to compensate for the time delay inherent in machine fields due to the inductance of the field.

The static voltage measuring circuit consists of an assembly of saturable transformers, capacitors, resistors, and rectifiers. Deviation of line voltage from desired value causes an amplified signal to change excitation in a direction and magnitude to return the voltage to desired point. The damping transformer assembly is used to stabilize the control system.

According to the manufacturer, the exciter as a regulator is quite versatile when applied to the control of synchronous machines. Standard elements are available not only to control voltage, power factor or current, but also to prevent over excitation or under excitation.



Real rope economy is not cost to buy, but cost to use. Plymouth Ship Brand Manila costs less to use because its tensile strength averages as much as 25% above published "minimums". This extra strength gives longer life under accepted safety practices and extra protection against accidental overloads. Play safe next time and specify Plymouth Ship Brand Manila—your best rope buy for any industrial job. Return coupon for helpful data.





Now you can have the same high quality, hot-dip galvanizing as used on our own products. You get a tough finish that withstands severe bends without cracking or flaking. Hot-dip galvanizing forms a bond between the iron or steel and molten zinc—providing positive protection against rust and corrosion.

Write for quotations on this superior service. Give full details of materials, including dimensions.

> \*Single-dip size—Larger sizes by double-dipping.

Atlantic Steel Company

Relief Valves

McDonnell & Miller, Inc.,
3500 N. Spaulding Ave.,
Chicago 18, Ill., have developed assemblies, consisting of two or
three safety relief valves, for safeguarding larger hot water heating
boilers from excessive pressure.

The assemblies give a discharge capacity equal to the sum of the capacities of the two or three valves. Assemblies consisting of proper size valves and manifold are packaged completely made up and ready to install.

According to the manufacturer, two or three smaller valves with small size orifices are preferable to larger orifice valves of equal capacity because the use of smaller valves circumvents the objectionable excessive discharge which characterizes large-orifice relief valve when called upon to discharge small amount of surplus water produced by expansion.

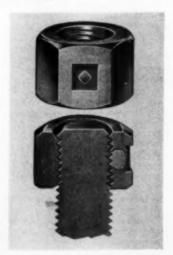
With these assemblies, when boiler pressure reaches 30 psi only one valve opens, and opens only enough to take care of normal thermal expansion.

#### Self-Locking Nut

H-28

Townsend Company, New Brighton, Pa., is now producing a one-piece, prevailing torque type of self-locking nut which is usually furnished doubled chamfered. Extruded nylon is used as the locking medium.

The design of the nut permits installation from either end and provides positive locking action in any postion. Installation torque is low, which saves time. Lock washers and subsequent double assembly, handling and stocking problems are said to be eliminated.



UNICIPAL ELECTRIC PLANT

MUSCATINE, IOWA

### Knows the value of

## (lutomatic



Republic automatic boiler control and instrument panels at Muscatine Municipal Electric Plant

● In 1941 the Municipal Electric Plant at Muscatine, Iowa, installed a modern 100,000 lb. per hr. steam generator. In 1948 a second boiler rated at 160,000 lb. per hr., 650 psi. was added.

In any steam electric generating plant, electric power rates and steam costs go hand-in-hand. Low steam cost however, is not the result of efficient boiler design alone. To realize all the operating advantages of these modern boilers, each was equipped with a Republic automatic combustion and feed water control system at the time of installation.

The installation of Republic automatic controls on your boiler or (boilers) will enable you to:-

SAVE FUEL by automatically maintaining highest combustion efficiency.

INCREASE STEAM OUTPUT by operating the boilers at test efficiency 24 hours a day, 7 days a week.

CONSERVE MANPOWER by automatically performing the many routine repetitive adjustments.

REDUCE OUTAGES by maintaining uniform operating conditions.

Find out about Republic control systems. One of our engineers will be glad to consult with you at any time. Write us today.

REPUBLIC FLOW METERS CO. • 2240 DIVERSEY PARKWAY • CHICAGO 47, ILLINOIS



#### Rigid KENNEDY Inspection **Guarantees Fittings Free of** Leaks, Burrs and Scales



KENNEDY MALLEABLE-IRON screwed fittings are made with tough, close-grained iron, tested to 43,000 psi. Carefully controlled annealing prevents splitting or cracking under almost any distortion forces. Uniform hot-dip galvanizing assures a heavy coating that will not chip or flake. Precision machining provides exact alignment . . . speeds installation time.



KENNEDY CAST-IRON screwed and flanged fittings, are made with tough, close-grained metal more than 50% stronger than ordinary gray iron. Precision threading and accurately machined flanges help you get strong, tight joints easily. The complete Kennedy line also includes cast-iron sprinkler and drainage fittings, and cast-iron flanges.



KENNEDY BRONZE fittings with tensile strength of 34,000 psi are individually tested to 100 lbs. air pressure under water to insure freedom from leaks. Available rough or polished in all standard types and sizes.

WRITE FOR BULLETIN 104



ENNED

ALVES . PIPE FITTINGS . FIRE HYDRANTS

#### Taylor-Parker Appoints Word

E. PRENTYS WORD has been appointed Vice President and General Manager of the TAYLOR-PARKER Co., INC. NORFOLK, VA., distributors of industrial supplies and machinery in VIRGINIA, NORTH CAROLINA, and SOUTH CAROLINA.

Mr. Word is well known in the Southeastern states as representative for the LUNKENHEIMER COMPANY. manufacturers of valves and engineering specialties.

#### Plibrico-Alabama

THE GULF STATES INSULATION Co., P. O. Box 1281, Mobile 7, Ala., have been appointed distributors for the PLIBRICO JOINTLESS FIREBRICK Co., Chicago, Ill. Gulf States will act as distributors of refractory products, maintaining a complete boiler setting and installation service.

#### Nordberg Transfers Young

NORDBERG MANUFACTURING Co., Milwaukee 7, Wis., has transferred WILLIAM C. YOUNG, Sales Engineer, from the Milwaukee office to the company's Washington, D. C. office. JOSEPH M. MONROE will assume Mr. Young's duties in the Milwaukee

#### A-C Organizational Changes

W. A. ROBERTS has been re-elected as president of ALLIS-CHALMERS MANUFACTURING Co., Milwaukee, Wis. BOYD S. OBERLINK, formerly assistant to the vice president in charge of the tractor division, has been elected as

#### **FUTURE EVENTS** Of Engineering Interest

NATIONAL ASSOCIATION OF POWER ENGINEERS, INC., A. F. Thompson, Dir. of Exhibits, Suite 1659, 176 West Adams St., Chicago 3, III. Aug. 21-23, Golden Anniversary National Power Show, Hotel Plaza, San Antonio.

Texas.

AMERICAN SOCIETY OF MECHANICAL

MERICAN SOCIETY OF MEXIMANICAL ENGINEERS, C. E. Davies, Sec'y, 29 West 39th St., New York, N. Y. Sept, 10-14, Industrial Instruments and Regulators Division and Instrument So-ciety of America Exhibit and Joint

Conference, Houston, Texas.

Sept. 24-26, Petroleum Mechanical Engineering Conference, Hotel Mayo, Tulsa, Oct. 11-12. Fuels and AIME Coal Divisions

nference, Hotel Roanoke, Roa-

Joint Conference, Hotel Roanoke, Roanoke, Va. noke, Va. 99, 25-30, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, R. G. Mac-donald, Sec'y, 122 East 42nd St., New York, N. Y.

York, N. Y.
Oct. 15-18, Engineering Division, 6th Annual Conference, General Oglethorp Hotel, Savannah, Ga.

## EXTRA LONG LIFE

- Because of Quality Construction

GARLOCK Rubber Expansion Joints are made of a high-grade rubber compound specially developed by Garlock for long, economical service on pipe lines and other equipment. Furnished in three styles: No. 204 for Pressure, No. 205 for Vacuum, and No. 206 for Pressure and Vacuum. Available in neoprene construction for oil service.

#### 8 Superior Features:

- 1. Made of high-grade rubber, they do not crack or fracture under repeated flexing.
- 2. They do not take a permanent set.
- 8. For pressures from 40 to 125 p.s.i.; and for vacuum of 30 in. of mercury.
- 4. Suitable for operating temperatures up to 180°F.
- 5. They do not corrode or erode.
- 6. They are light in weight and can be installed in a limited space.
- 7. They require no gaskets between the flanges of the joint and the flanges of the pipe.
- 8. They do not induce electrolysis.



In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.



Garlock "multiple arch" Rubber Expansion Joint.



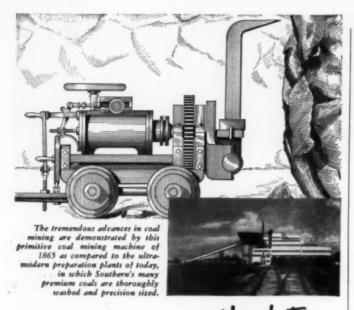
Arrow points to one of steel reinforcing rings in single arch joint.



Garlock expansion joints are furnished in all pipe sizes from 2" to 72".

GARLOCK

RUBBER EXPANSION JOINTS



## Here's why SOUTHERN'S WIDE SELECTION of premium, washed coals can help you reduce steam costs

Basic requirement for most economical steam production is to make certain that the right coal is applied to your specific type of burning equipment. SOUTHERN'S service to industry fulfills this requirement two important ways:

- The industry's widest selection of scientifically prepared premium coals from the leading eastern and midwestern fields and seams.
- A staff of trained combustion engineers-ready to consult with you on which one of SOUTHERN'S many coals can effect greatest savings in your plant.

SOUTHERN'S approach to all types of coal purchasing and burning problems is factual-including plant surveys and actual burning tests.

Add to this, SOUTHERN'S dependable supply...big production in excess of 10,000,000 tons annually from the most modern mines in existence...plus vast reserves.

Get the full details about how SOUTHERN'S service is lowering costs in hundreds of America's leading steam producing plants. Call, wire or write our nearest branch office today.

#### AS MANY AS 25 PREMIUM COALS

SOUTHERN offers industrial buyers a wide variety of premium coals from the coal fields of Western Kentucky, West Virginia, Virginia, Eastern Kentucky, Illinois, Indiana, Alabama, Arkansas, and Oklahoma. One is right for your plant!



vice president and will continue to serve in the tractor division.

The general machinery division has announced the appointment of J. F. ROBERTS as director of engineering, and R. C. ALLEN as consulting engineer.

Organization of a new mechanical power department headed by W. A. Yost has also been announced by the company.

#### Emerson Electric Announces Major Organizational Changes

The EMERSON ELECTRIC MFG. Co., St. Louis, Mo., has announced the election of HENRY C. MILLER as vice-president and general works manager and RAYMOND E. OTTO as vice-president and general sales manager.



Raymond E. Otto

Mr. Miller joined Emerson in 1936 as a layout engineer and was, prior to his new appointment, works manager over all Emerson operations.

Raymond E. Otto, now vice-president and general sales manager, joined Emerson in 1914 and was previously general sales manager of the company.

#### Jet Engine Test Facility-Tenn.

Electrical work is underway for the High-Altitude Engine Test Facility at the ARNOLD ENGINEERING DEVELOPMENT CENTER, TULLAHOMA, TENN., according to the ALLEGHENY INDUSTRIAL ELECTRICAL Co., of Pittsburgh, the electrical contractor.

The unit will be used to test fullsize turbo-jet and ram-jet engines under simulated flight conditions of speed and altitudes—up to as high as 80,000 feet. This engine test facility is built around a nucleus of German jet engine test equipment but considerably modified and modernized to reflect present day requirements.

Jet engines much larger than those now used in American aircraft will be tested in this facility and it will have a testing capacity six to eight times that of equipment available at Wright-Patterson Field, at Dayton, Ohio. It will require over 75,000 hp to operate, and possesses a maximum degree of flexibility so that simultaneous operation of two test chambers is provided.

Cost of the mechanical and electrical work, being handled by THE RUST ENGINEERING COMPANY, of BIRMINGHAM, and Pittsburgh, for the Corps of Engineers, U. S. Army, will approximate \$3,100,000. The Cost of the entire facility will approximate \$16,000,000.

Scheduled for shakedown tests in early 1952, it will be the first operational facility placed in service at the huge development center.

#### Deering-Milliken Mill One-Third Complete

The new 2½ million dollar hatch weaving mill located near COLUMBUS, NORTH CAROLINA, is now nearly one-third complete according to a recent report from the DANIEL CONSTRUCTION COMPANY, GREENVILLE, S. C. and BIRMINGHAM, ALA., general contractors for the project. Plans were prepared by the DEERING-MILLIKEN engineering department for this 180,000 sq ft structure. Foundations and steel work have been completed. The structure is totally enclosed, air-conditioned and will be finished in glazed tile throughout.

#### White Horse Mill Nearing Completion

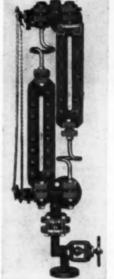
THE MAVERICK MILLS New WHITE HORRE MILL in GREENVILLE, SOUTH CAROLINA is rapidly approaching completion according to a recent report from THE DANIEL CONSTRUCTION COMPANY, contractors for this project. This \$2,000,000 unit is one of only two complete bale-to-cloth cotton mills to be constructed since the war. The other is the new UTICAMONAWK plant located in SENECA, SOUTH CAROLINA.

#### Stone Mfg. Co.-Greenville, S. C.

Construction of an apparel manufacturing plant to cost in excess of \$2,000,000, is under way by STONE MANUFACTURING COMPANY, at a site on New Buncombe Road. E. E. Stone III is President of the company.

Shockley Construction Company of Columbia, S. C., is erecting the modern sewing plant, which will be of brick and steel construction, approximately 250 ft wide x 500 ft long. The plant will be insulated through





YOU'LL find that this Jerguson Model
618HP Gage will give you the kind of job
you want in your power plant . . . rugged,
efficient, uninterrupted, long life service.

You are assured of top performance because Jerguson has built the Model 618HP to meet the most exacting requirements of high temperature work. Both chamber and cover are rugged forged steel. At either end are specially designed Jerguson expansion coils. These coils, by absorbing excessive expansion and contraction, insure proper functioning of the gage under highest temperature conditions, and are another special Jerguson feature that assures you of highest accuracy and dependability. Valves on the Model 618 are for flanged or socket welding connections with outside screw and yoke.

Jerguson High Pressure Steam Gages are available in all pressures to suit your needs. The Model 618HP meets exacting Navy requirements and is now in use on scores of U. S. battleships and destroyers. It will pay you to investigate.

Jerguson offers a complete line of high pressure steam gages, inclined gages, and remote reading gages for power plant use. Write today, without obligation, for free illustrated DATA UNIT on the type of gage in which you are interested.

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

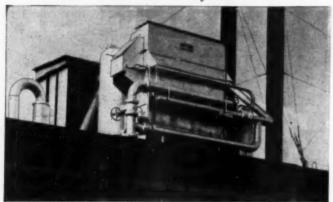
Representatives in Major Cities
Phane Listed Under JERGUSON

JERGUSON GAGE & VALVE COMPANY

100 Fellsway

Somerville 45, Mass.

#### Direct saving of cooling water expense returns to you the cost of a Niagara Aero After Cooler in less than two years.



#### How to Get Drier Compressed Air:

It prevents many troubles and saves much expense

● NIAGARA AERO AFTER COOLER cools compressed air or gas below the temperature of the surrounding atmosphere. Therefore you get no further condensation in your lines. You save much in repairs to pneumatic tools and equipment; you save much interruption to production; you save water damage in paint spraying, in air cleaning, in any process where compressed air comes in contact with your materials or parts in manufacturing (sand blasting, for example).

Niagara Aero After Cooler uses evaporative cooling, saving 95% of your cooling water consumption. This saving quickly returns the cost of the equipment to the owner or makes extra cooling water available for other processes.

The Niagara Aero After Cooler produces compressed air with 30% to 50% less moisture than by ordinary cooling methods. Other Niagara equipment provides bone-dry air for processes requiring it.

If you have an air problem or a cooling problem, a Niagara engineer probably has an answer that will improve your process or save you operating or maintenance expense.

Write for Bulletin 98

#### NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. SP, 405 Lexington Ave.

New York 17, N.Y.

Experienced District Engineers in all Principal Cities

out with Fiberglas. The building is designed so that additions may be made at either side. The one-story, modern, windowless structure will include, besides manufacturing facilities, a cafeteria, restroom and first aid facilities, clerical and administrative offices.

The firm manufactures ladies' slips exclusively from cotton piece goods. Practically all materials required are purchased from Carolina mills. The planned output of the new factory will be in excess of 18,000,000 garments annually.

#### Allis-Chalmers—Shreveport

MELVIN L. SCOTT has been named a general machinery division sales representative in ALLIS-CHALMERS SHREVEPORT district office. He will specialize in the sale of small pumps and motors.

Scott came to Allis-Chalmers in 1949 following graduation from Oklahoma A & M. He is a member of the American Institute of Electrical Engineers.

#### Infilco Names L. K. Cecil

The Board of Directors of INFILCO INCORPORATED, 2750 S. 12th Ave., Tucson, Ariz., have elected LAWRENCE K. CECIL Vice President. Cecil has been General Sales Manager of the company since August, 1950, and has been with the company for twenty-five years in the capacity of Sales Engineer and District Manager.

#### Donald D. Beach Dies in Atlanta

DONALD D. BEACH, Industrial Sales Manager for ATLANTA GAS LIGHT COMPANY, died in Atlanta, April 29, after an illness of several months. A native of Ottawa, Ohio, he attended Ohio State University and had been connected with the gas industry for more than twenty years. Before joining Atlanta Gas Light Company and Affiliated Companies in 1930 as Industrial Engineer at Newman, Griffin and Macon, he was District Engineer for the Ohio Fuel Gas Company at Columbus, Ohio. He became Industrial Sales Manager for Atlanta Gas Light Company in 1941.

At the time of his death, Mr. Beach was Chairman of the Ethics and Practice Committee of the Georgia Chapter of Professional Engineers. He had served as President of this Society and also had been President of the Georgia Chapter of the American Society for Metals. He was also a member of the Georgia Engineering Society and the American Gas and Southern Gas Associa-

TIONS.

What Metals Are Best For Centrifugal
Boiler Feed Rumps?

Drawing on their long experience in the field of hydraulics, Worthington engineers produce boiler feed pumps that are metallurgically correct in design, meeting every requirement as to temperature, pressure and corrosion-erosion resistance. As a result, Worthington boiler feed pumps perform better and last longer.



Three Worthington Axially Split Contrifugal Boiler Feed Pumps At The Kansas Power And Light Company Plant, Hutchinson, Kansas.

The following table represents Worthington's recommendation of materials:

Casing	Filtings	Maximum Temperature
1. Cast from	Bronze	250 F
2. Cast Iron	13% Chromium Stainless Steel	350 F
3. Carbon Steel	Bronze	250 ₽
4, Carbon Steel	13% Chromium Stainless Steel	400 F
S. 5% or higher Chromium Steel	13% Chromium Stainless Steel	Any temperature normally encountered

pH neutral to 8,5 pressures un-der 1000 psi unless water is known to have corrosive oction. Any pH, but at pressures under 1000 psi unless water is known

Saldom used for boiler feed service — only where water is definitely known not to be

pH above 8.5, and only where water is definitely known not to be corresive.

Any pH and where water



One of Several Solid Barrel, Radially Split, High Pressure Boiler Feed Pumps at the Trenton Channel Station of the Detroit Edison Co.



and a thorough knowledge of application show THERE'S A RIGHT WORTHINGTON PUMP FOR YOU

This proven selection of materials coupled with the most advanced design, superior workmanship

. . . right for the pressure and temperature of your boiler feed service . . . right for maximum economy and dependability. For further proof that there's more worth in Worthington, contact our nearest District Office, or write to Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.



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Simplified gear system - balanced design - compact - rugged - heavy overhung loads-highly efficientabundant lubrication-low output shaft-Herringbone Rotor-positive oil seals-protected-streamlinedthrough ventilation - quiet operation - AGMA speeds - long life every unit operates in any position.

Ask for your copy of pictorial bulletin No. F. 74 showing Sterling Electric Power Drives Turning The Wheels of Industry.

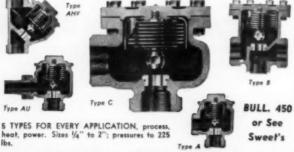
Plants: New York 51, N. Y.; Los Angeles 22, Cálifornia; Hamilton, Canada; Santiago, Chile. Offices and distributors in all principal cities.

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Chief Engineer H.F.D. stated, after Nicholsons replaced mechanical traps in his plant: "Saving in steam waste cut our fuel cost at least 10%. Yet application temperatures were up 30°-40°. And relief of all air binding effected faster warm-up."

Operate on lowest temperature differential: 2 to 6 times average drainage capacity; maximum air venting. For other advanced Nicholson features send for Bulletin 450.



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#### Pennsalt Industrial Chemicals Department

THE PENNSYLVANIA SALT MANU-FACTURING COMPANY has formed a new sales department, the Industrial Chemicals Department, combining the former Heavy Chemicals and Special Chemicals Departments.

The new department will be headed by ALBERT H. CLEM, formerly assistant to the vice president in charge of sales. Mr. Clem will report to R. S. ROELLER, Assistant General Sales Manager.

#### Janette Mfg. Co. Expands

The JANETTE MANUFACTURING COM-PANY of Chicago has purchased the sub-fractional Gear-Motor business of Robbins & Myers, Inc. of Springfield, Ohio, according to an announcement made by John F. Ditzell, President of the Janette company.

Janette also announced the purchase of five acres of land in the Skokie suburban district of Chicago for the erection of a new plant.

#### Synchro-Master Joins % Proportioneers, Inc. %

% PROPORTIONEERS, INC. %, Providence, R. I., manufacturer of chemical proportioning and feeding equipment, has acquired Synchro-Master Company, formerly of Seneca Falls, New York, and will operate the business as its Synchro-Master Division with sales and production facilities located in Providence. The key personnel of the Synchro-Master Company has also joined %Proportioneers% and will manage the new division.

#### C.T.I. Appoints Shoudy

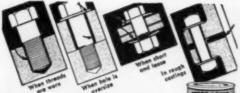
As a further step in their water conservation program, the Cooling Tower Institute announces the appointment of Mr. W. A. SHOUDY, consulting engineer of New York City, as Executive Manager.

Mr. Shoudy's office and the headquarters of the Institute are at Basking Ridge, N. J., in the metropolitan district of New York City.

#### Southwest Research Institute Expands

A mounting demand for research in the field of mechanisms has forced SOUTHWEST RESEARCH INSTITUTE to provide new and larger quarters for its Mechanical Laboratory, C. DES-MOND PENGELLEY, Chairman of Engineering Mechanics, has announced.

Under the direction of CHARLES E. BALLEISEN, research specialist in auto-



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Bolts with worn threads—undersize bolts in oversize holes—bolts passing through thin walls—bolts holding ill-fitting cest flanges—all can be tightened firmly with quick-setting Smooth-On No. I Iron Cement. Use it, too, to lock nuts tight, and to cover and protect countersumk bolt heads in metal or wood. These repairs stay tight because Smooth-On expands slightly as it hardens. Buy Smooth-On No. I in 7-az, 1-lb., 5-lb., 20-lb., or 100-lb. size and leep it handy. If your supply house hasn't Smooth-On, write us.

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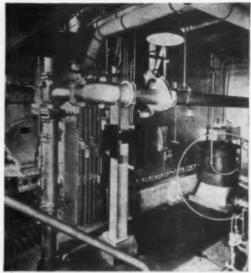
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SOUTHERN POWER & INDUSTRY for JULY, 1951



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Our seat rings are cut from seamless drawn brass tubing, free from all casting defects—sound and uniform always.

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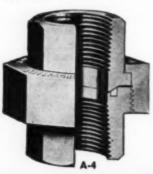
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#### Automatic-Dallas

JOHN GILLIAM EQUIPMENT COM-PANY, DALLAS, TEXAS, has been named sales representative for the AUTO-MATIC TRANSPORTATION COMPANY, Chicago, maker of electric industrial trucks.

The firm, headed by JOHN W. GIL-LIAM, will serve the northern half of TEXAS. The company is located at 1330 North Industrial Boulevard, Dallas. Gilliam was vice-president of the Dillon Scale and Equipment Co. for four years before organizing his own sales firm. He is a graduate of Simmons University in ABILENE, and a member of the Society of American Military Engineers.

#### Books for the Plant Engineer

Servomechanisms and Regulating System Design, Vol. I

BY HAROLD CHESTNUT AND ROBERT W. MAYER.

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Price, \$7.75.

This volume presents the feedback control problem with the objective of training design and application engineers. The book starts from the basic mathematics, describes the nature of the physical problems involved, and proceeds to the solution of advanced designs. It emphasizes feedback control concept for regulators and servo-mechanisms. Both differential equation and Laplace transform methods of solving transient problems are presented. The importance of stability is strebued and many typical systems are illustrated.

The analysis and synthesis of the type of multiple loop and multiple input systems encountered in practice are discussed from the attenuation point of view. The book stresses the practical approach to system synthesis: dynamic as well as static error coefficients are presented.

Charts are presented indicating nature of design characteristics necessary to obtain desirable steady-state and transient responses.



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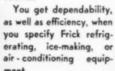


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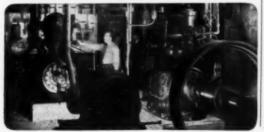
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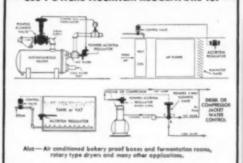
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THE BEST WAY TO
STRIP PAINT FROM
METAL PARTS TOO

LARGE TO BE SOAKED IN TANKS? See Page 3



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answers many questions that will lead you to better stripping procedures. You'll want to read more about:

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See page 12.

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### **Catalogs and Bulletins**

(Continued from p. 18)

Free additional information is available to readers of Southern Power & Industry. Check item number on the postage free service coupon post card—page 17.

B-10 INCINERATORS — Booklet, A.I.A. File No. 35-J-41, 16 pages—Problem of industrial reduce is discussed, and incinerators are described and illustrated with actual plant photographs. Diagrams explain installation and operation.—PLI-BRICO JOINTLESS FIREBRICK CO., 1800 Kingsbury St., Chicago 14, Ili.

B-11 TESTING INSTRUMENTS—Rulletin GEA-5465, 16 pages—Covers now 
hook-on power-factor meter, hook-on voltammeter, hook-on wattmeter, and other 
testing instruments. Illustrated with applicational and equipment photographs. Price 
list is included.—GENERAL ELECTRIC 
COMPANY, I River Road, Schenectady 5, N. Y.

B-12 DISPATCH SYSTEMS — Rulletin patch systems for industrial use are discussed including uses, controls, operation, and construction. Line drawings and disgrams illustrate details of equipment.—
THE AMERICAN MONORALL COMPANY, 13107 Athens Ave., Cleveland 7, Ohlo.

B-13 WELDING EQUIPMENT—Catalog 501, 116 pages—Describes and illustrates noziles, welding necks, and large diameter flanges. Includes data on TEMA Standards. Also incorporates "Modern Flange Design." Prepared for those Interested in pressure vessel work.—TAYLOR FORGE & PIPE WORKS, P. O. Box 485, Chicago 90, III.

B-14 ALUMINUM PAINT—Bulletin No. 525, 4 pages—Describes the company's new aluminum paste and its use in pigmentation of aluminum paints for industrial and maintenance use, in aluminum painting of bridges, valves, tanks, machinery, piping, motors, and other equipment.—METALS DISINTEGRATING COMPANY, INC., Elizabeth, N. J.

B-15 ENGINE WATER COOLERS—Catalog No. 1351, 41 pages—Illustrates and describes new line of engine jacket water coolers for portable equipment installations. Discusses design features and accessorios. — YOUNG RADIATOR COMPANY, Racine, Wis.

B-16 FLAME HARDENING — Reprint ADR 79, 6 pages—"Plame Hardening of Large Surfaces" covers use of flame hardening for industrial requirements. Includes information on new high capacity flame hardening torch. Photographs and shetches illustrate principles and application.—AIR REDUCTION SALES COMPANY, 60 East 42nd St., New York 17, N. Y.

B-17 PREFABRICATED PIPING—Bulletin WPI. 8 pages—Covers pipe bends, colis, headers, manifolds, Vanstone work, process piping, and welded assemblies for use by power generation, petroleum, pipe line transmission, paper, steel, chemical, and heavy industries.—WESTERN PIPING 8UPPLY DIVISION of THE LUMMUS CO., 564 West 148th St., East Chicago, Ind.

B-18 OIL BURNING SYSTEM—Bulletin 169-B. 4 pages—Describes constant differential system for use on oil combustion installations. Includes typical steam flow chart showing experience of a specific plant.—PEABODY ENGINEERING CORP., 586 Fifth Ave., New York 19, N. Y.

B-19 HYDRAULIC LIFTS — Bulletin, ferent lifting, loading, positioning or machine feeding operations which are done with hydraulic power, with case blatories of the company's materials handling lift installations.—GLOBE HOIST COMPANY, E.

Mermaid Lane at Queen St., Philadelphia

B-20 INDUSTRIAL PIPING — Bulletin and erection of industrial piping. Shows installations in steel mills, for gas transmission system, central power stations, water pumping stations, heating plants, oil refineries and chemical process plants.—DRAVO CORPORATION, Neville Island, Pittoburgh 26, Pa.

B-21 COMBUSTION SAFEGUARD—
fiame protection for industrial applications, including the new "flame-rectification principle" of operation, descriptions of system components, installation drawings, and 24 different safeguard systems.— MINNEAPOLIS-HONEYWELL REGULATOR CO., Industrial Division, Wayne & Windrim Aves., Philadelphia 44, Pa.

B-22 Section 260-B, 36 pages—Hustrates and describes acrew conveyors in many types and assemblies for handling various materials. Typical asplications for products and industries are listed. Dimensions, prices, diagrams, and photographs are included.—FORT WORTH STEEL & MACHINERY CO., 2600 MCCart St., Fort Worth, Texas.

B-23 TRACTOR SHOVEL — Catalog "Model HA Payloader"—Describes a 12 cu ft tractor shovel for bulk material handling. Applicational photographs show jobs and industries where the unit is useful.—THE FRANK G. HOUGH CO., \$75

B-24 VALVES FOR LIQUIDS—Bulletin describes Rollo valves for viscous liquids and liquids with solids; shows valve cover, valve spring, valve, and valve seat for industrial pumping, and cites specific applications.—WORTHINGTON PUMP & MACHINERY CORP., Harrison, N. J.

B-25 UNDERGROUND PIPE CONDUIT
pages—Describes complete conduit system
for protection, support, and insulation of
uderground pipe lines—hot or cold, Illustrated.—H. W. FORTER & CO., INC.—
REID HATDEN, INC., Insulation Engineers
& Contractors, \$25 Frelinghuysen Ave.,
Newark S, N. J.

B-26 MOTOR CONTROLS—Handy Catainformation, dimensions, and prices of the more popular items of the company's line of motor controls. Includes ready-reference A-C and D-C index along margins of each page.—ALLEN-BRADLEY COMPANY, Milwaukee, Wis.

B-27 PLASTIC TAPE.—"Scotch Electrical Tape No. 22," 4 pages—Tella how to stop service pipe corrosion with "Scotch" brand electrical tape. Nine pictures show application techniques, and tape's chemical, physical, and electrical properties are listed.—MINNESOTA MIN-ING & MFG, CO., 900 Fauquier St., St. Paul 6, Minn.

B-28 SPEED REDUCERS—Bulletins Apages—Double reduction torque-arm speed
reducer series, and single reduction series
of torque-arm reducers are covered. Mechanism is described, and installational data
is included. Illustrated.—DODGE MANUPACTURING CO., Mishawaka, Ind.

B-29 MATERIALS HANDLING EQUIP-MENT-Bulletin 1102-MH, 3-1-51, 19 pages-Tractor, freight truck, lift truck,

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fork truck, and pallet truck are described, including equipment and operational photographs.—MARKET FORGE COMPANY, Everett 49, Mass.

B-30 POWEB TRANSMISSION—Catalog No. C 172-51, 15 pages—A new power transmission five is illustrated and described in detail, including principle of operation and method of installation—MORSE CHAIN COMPANY, 7601 Central Ave., Detroit 8, Mich.

B-31 INDUSTRIAL CLEANING — Booklet "Cut Maintenance Coats with Dowell Service." 8 pages—Describes method of cleaning industrial equipment with chemiicals, and includes "before" and "after" photographs of actual applications.— DOWELL INCORPORATED, Dept. P. P.O. Box 538, Tubus 3, Okta.

B-32 SAFETY BULES—Booklet "Safety rules for the fork-truck driver in readable pocket size booklet illustrated with cartoons and equipment photographs. — CLARK EQUIPMENT COMPANY, Industrial Truck Division, Battle Creek, Mich.

B-33 FIPE TOOLS—"Operating Guide," how to locate and correct pipe machine and hand pipe tools troubles. Thirty-one different operations are covered.—BEAVER PIPE TOOLS, INC., 324 Dana Ave., Warren, Ohio.

B-34 AIR CONDITIONING — Catalog ment needed to do a job of air conditioning: cooling, heating, debumidifying, cleaning, filtering, circulating; ventilating; air handling. Illustrated. — WESTINGHOUSE ELECTRIC CORP., Sturtevant Division. 300 Readville St., Hyde Park, Boaton 36, Mass.

B-35 MEASUREMENTS AND CONTROL

-Technical Bulletin No. B61-2, 24

pages-Covers measurement of pH, redox,
and conductivity in industrial control systenus; fundamental principles of electrochemical measurements and final control
elements for automatic control systems.

MINNEAPOLIS - HONETWELL REGULATOR CO., Wayne & Windrim Aves., Philadelphia 44, Pa.

B-36 THREAD INSERTS—Bulletin No. data on helical-wire thread inserts and use of these inserts in protection and repair of tapped holes. Explains use as components to protect threads in aluminum, magnesium, plastics, iron, steel, and wood.—HELI-COIL CORPORATION, 4:-23 Thirty-Pitth St., Long Island City, N. Y.

B-37 TRAMP IBON BEMOVAL—Catalog 15, 16 pages—"Non-Electric Permanent Magnetic Separators for Tramp Iron Removal" are described, with engineering data, photographs, drawings, and tabular specifications—THE ERIEZ MANUFACTUR

B-38 AIB COMPRESSOR—Bulletin HBrute 16° portable air compressor, including construction, operation, application, and
table of specifications. Illustrated with
photographs and drawings.—WORTHINGTON PUMP & MACHINERY CORP., Adv.
Ext., Dunellen, N. J.

B-39 DIESEL ENGINES—Bulletin S-500-B52A, 18 pages—Describes and pictures four-cycle, direct infjection, totally enclosed engines with photographs, cut-away line drawings, and specifications. Also covers the dual fuel Diesel and the Super-charged dual fuel Diesel,—WORTHINGTON PUMP AND MACHINERY CORPORATION, Harrison, N. J.

B-40 ASH HANDLING — Brochure No. 151, 20 pages—Illustrates and describes "Hydrojet" ash handling systems—basic arrangements and advantages, operation and construction, and applications.—ALLEN-SHERMAN-HOFF CO., 225 S. Fifteenth St., Philadelphia, Pa.

B-41 DIESEL ENGINES—Bulletin 183, 6 pages—Describes construction and operation features of the company's fourcycle, one cylinder and recently introduced two-cylinder, vertical, machanical injection, Type 4PS Diesel engine, built with 4% bore and 5¼ stroke, available with electric or manual starting. Hiustrated.—NORDBERG MANUFACTURING CO., Milwaukee 7, Wis.



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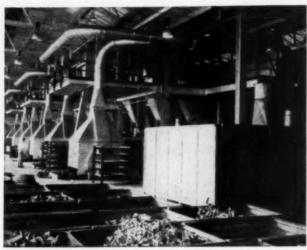
A A A IRON & STEEL CO. 2401 Canton, Dallas, Texas

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INDUSTRY

# 1st in Industrial Good Housekeeping... EFFICIENT DUST CONTROL

Casting shake-out booths in a leading farm implement manufacturer's plant.



 Well engineered and effective dust control is necessary to maintain cleanliness and efficient operation.

The photo shows a foundry shake-out room in which dust is effectively suppressed and removed at the source by virtue of collection both above and below the shake-out.

There is no simple "formula" for the selection of dust control equipment. For guaranteed results — just one contract, one responsibility for a complete, ready-to-operate system, consult experts. If you need a new system . . . or more capacity in an existing one, call on Liberty Engineering.



ENGINEERING AND

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A Division of The Kirk & Blum Mfg. Co.



-completely eliminate annoying blinking and flickering of dead fluorescent lamps!

GUARANTEED -

This is a glow switch condenserious precision starter equipped with automatic thermal relay circuit breaker. The relay automatically removes the lamp from the circuit electrically when the lamp forcess described and automatically resets upon interruption of the lamp circuit.

SIMPLIFIES — Replacement of defective lamp automatically recycles starter circuit. No buttons to push — no replacement of starter.

REDUCES COST — Magno-Tronic starters provide exact timing of electrode heating, preventing excessive loss of emission material, thus assuring maximum lamp life.

VERSATILE — Built to operate efficiently over an extended voltage and temperature range with absolute dependability.



SP-15-20 For use with 15 or 20 watt lamps.

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SP-85-100 For use with 100 watt lamps.

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# Free Swinging Buckets CAUSE TRAP TROUBLE



● Steam traps with free swinging buckets cause trouble sooner or later. Uncontrolled bucket action inevitably causes bucket damage and leads to high replacement costs. SUPER-SILVERTOP Steam Trap is the only steam trap with a patented guided bucket. A guided tube positively controls the bucket, eliminating the possibility of bucket swing. This is just one of the reasons why many manufacturers are changing their entire steam trap systems over to SUPER-SILVERTOPS. It will pay you to do the same. Talk it over with your nearest SUPER-SILVERTOP representative or write us direct.

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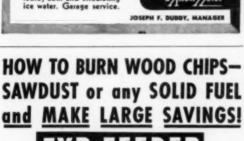
UPER-SILVERTOP STEAM

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Multiple, Fyr-Mobile and Flo-Matic Stoker Systems burn wood chips, sawdust and/or cheapest sizes of coal. One user recently changed from oil to FYR-FEEDE. WOOD. BURNING, using wood chips and sawdust hauled from a local sawmill. Total fuel cost is now less than \$150 per month as against \$950 for oil firing—a saving of \$800 per month.

#### FINES BURN IN SUSPENSION

These stokers automatically meter, feed, burn by continuously distributing airborne fuel over grate (the fines burning instantly in suspension) such fuels as wood (planer) chips, sawdust, cheaper coal sizes, coke breeze, hogged wood and other solid fuels and makes very large savings.

#### BIN-TO-BOILER CONVEYORS

FYR-FEEDER Automatic "Bin-to-Boiler" Conveyor Systems move fuel instantly from bin or waste wood storage vault to FYR-FEEDER Multiple or FLO-MATIC or FYR-MOBILE Stokers to meet steam demand. More steam is assured.

#### THEY PAY FOR THEMSELVES

Regardless of type of combustion equipment you now use, learn about FYR-FEEDERS—how they pay for themselves out of fuel and labor savings and WHY they are replacing underfeeds and other stokers, chain grates and oil burners. THOUSANDS of FYR-FEEDERS in service. They FAY for themselves. Write for Engineer—No Obligation. 15ee Fg. 65 Jan. 1951 Iss. 3o. Fwr. 6 Isd.1

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#### **American Coal Burner Company**

18-T East Erie St., Chicago 11, III.
WOOD WASTES—COAL—COKE—ALL SOLID FUELS





# **HORTON STORAGE**

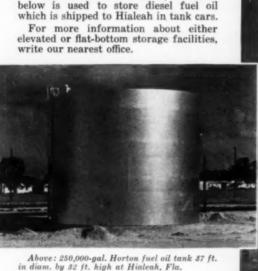
#### insures peak operating efficiency for Modern Railroads



Horton steel storage tanks are daily playing an important part in the efficient operation of the Hialeah, Florida, shops of the Seaboard Airline Railroad.

The highly functional structure at the right serves three purposes. It provides water (1) for use in the shop area, (2) for cooling radiators, and (3) for use in diesel locomotives. The different characteristics of water required for these different uses has necessitated building two tanks on the same structure. The upper tank, which has a capacity of 50,-000 gals., supplies water for domestic use. The lower tank has a gross capacity of 35,000 gals, and supplies cooling water for radiators. In addition, it has a 3,000 gal. compartment on the inside to store water for diesel engines. Piping on these tanks has been specially arranged to handle all three types of water and keep them separate.

The flat-bottom fuel tank illustrated below is used to store diesel fuel oil



Right: Upper elevated tank has a capacity of 50,000 gals. Lower tank holds 35,000 gals. and has a 3,000-gal. tank inside it.

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# practical piping layouts

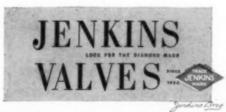
The second series of twenty-five basic Piping Layouts (published by Jenkins Bros. in leading industrial, professional, and engineering publications) is now available in booklet form.

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THIS SECTION
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Tells "Which valve where, and why"—with information in chart form for quick reference. A compact manual that will be prized by everyone, beginner and veteran alike, who plans piping.

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# Dowell Service cleaned seven heat exchangers in 19 hours!

This refinery had 7 heat exchangers that were badly fouled. Minimum downtime for cleaning was a prerequisite to maintain production. Dowell Service removed 80% of the deposits from the process sides in only 19 hours. As a result the operating pressure drop through the system was lowered from 80 p.s.i. to 5 p.s.i. with an equally satisfactory drop in operating temperatures.

Dowell Service is the answer to the maintenance engineer's demand for fast, efficient, economical cleaning. Maintenance time and costs can be cut by

applying Dowell Service to condensers, process towers, boilers . . . to nearly any type of industrial equipment. Dowell engineers fill the equipment to be cleaned with liquid solvents. These solvents are designed to clean places inaccessible to other methods. Costly dismantling is eliminated and downtime is shortened.

What's your cleaning problem? Dowell Service Engineers will be glad to consult with you on better, faster methods of cleaning your equipment. No obligation, of course. Dowell Service is as near as your telephone. Other recent Dowell jobs:

Oil, water, algae emulsion removed from refinery circulating water system in only 6 hours.

Water side of 15 tube and shell condensers cleaned for refinery. After Dowell Service, gasoline left condenser 20° cooler than when condensers were mechanically cleaned. Chief engineer estimates Dowell Service pold for liself in approximately 12½ days.

Partially carbonized oil and grease caused trouble in five 150,000 lb./hr. boilers in a Southwestern refinery. Dowell Service removed the deposits from each boiler in a few hours.



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